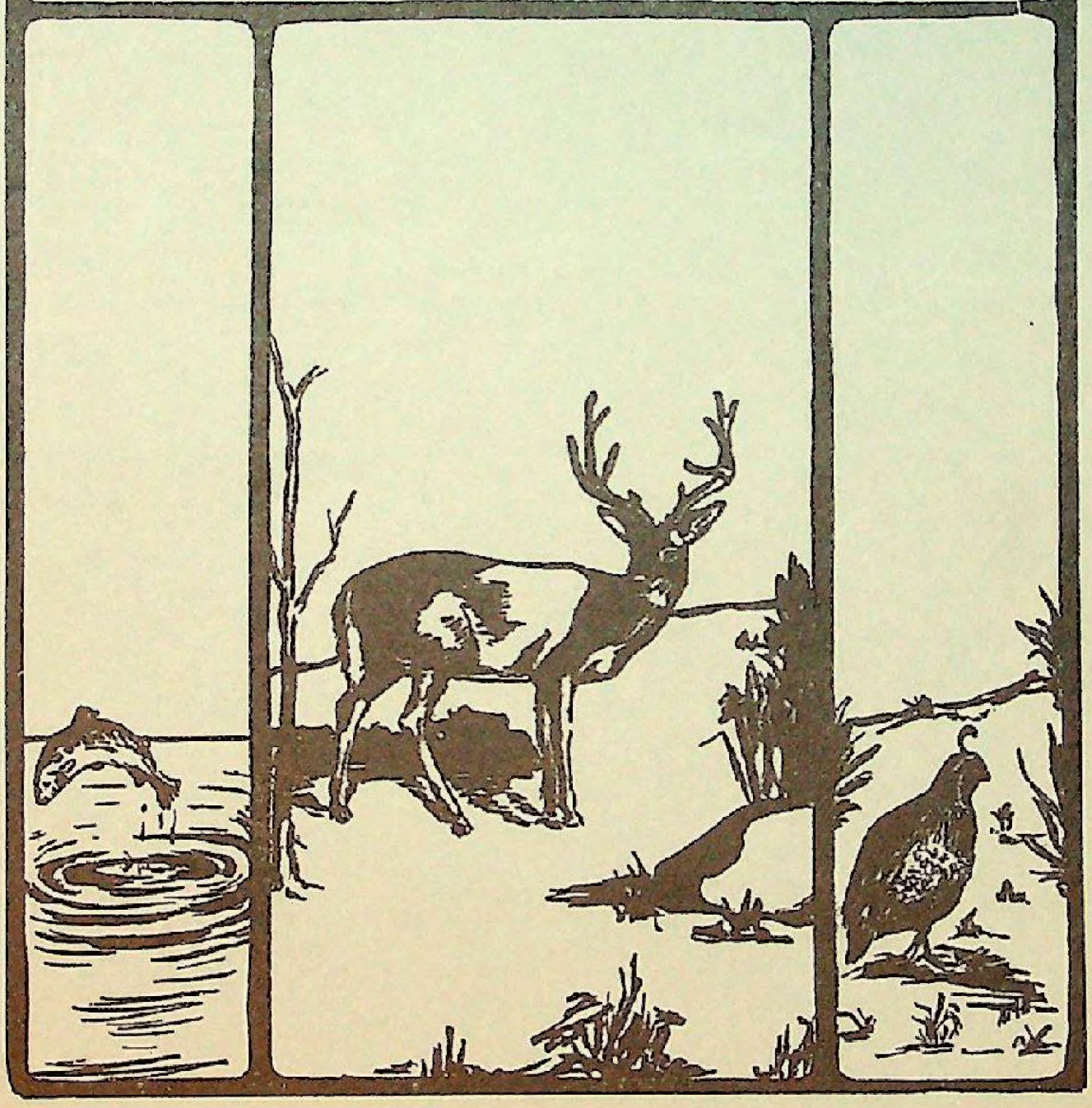
CALIFORNIA FISH AND GAME

"CONSERVATION OF WILD LIFE THROUGH EDUCATION"

Volume 16 San Francisco, January, 1930 Number 1



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DIVISION OF FISH AND GAME

San Francisco, California

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CALIFORNIA FISH AND GAME

"CONSERVATION OF WILD LIFE THROUGH EDUCATION"

Volume 16 SACRAMENTO, JANUARY, 1930 No. 1

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RESULTS OF FEEDING EXPERIMENTS WITH TROUT FRY

By George A. Coleman

The Bureau of Fish Culture, Division of Fish and Game, has just completed one of the most comprehensive series of experiments ever undertaken under normal hatchery conditions. The experiments involved a variety of mixtures of food for young trout fry in the state's hatcheries.

The object of these experiments was: To reduce the food bill cost, owing to the recent advance in the price of beef liver; to obtain a mixture which could be secured in large enough quantities to take care of our constantly increasing production of fish; to obtain a mixture which would reduce the cost of labor in handling.

In deciding upon the experimental mixtures we had the advice of Dr. K. F. Meyer, director of the George William Hooper Foundation

for Medical Research, Dr. H. Van Roekel, pathologist, Paul A. Shaw, toxicologist, and Mrs. Nina Simmonds Estill, nutrition expert.

An exhaustive review was made of the literature on the subject of trout food and reports of similar experiments tried out in eastern state hatcheries and U. S. Bureau of Fisheries Experimental Stations. Dr. H. C. Bryant, head of our Bureau of Education and Research, also reported upon personal observations made on a trip through the eastern states.

W. H. Shebley, chief fish culturist and head of the Bureau of Fish Culture, kindly placed at our disposal the results of his personal observations made during more than forty years of practical work in fish culture.

At a meeting and luncheon kindly tendered the staff by Dr. Meyer at the Hooper Foundation on January 9, 1929, a round-table free discussion was entered into by all staff members present, including the author, in an endeavor to bring out the possibilities of different ingredients suggested for these trial mixtures to be fed the young trout fry.

This discussion reduced the possible materials which could be secured in sufficient quantities to warrant a trial to five: dehydrated salmon eggs, sardine meal, shrimp meal, lactein and alfalfa, which it was thought might furnish necessary vitamines. It was also brought out that the results of all previous experiments, wherever made, showed that a percentage of raw beef liver is necessary in all food mixtures for young trout fry. The percentage of liver having varied from 25 per cent to 50 per cent in the various experiments tried.

In order to make a practical, as well as scientific, test of these food mixtures, it was decided to carry on the experiments simultaneously at five of our hatcheries, thus obtaining the reaction of different species of trout under different conditions of water, temperature and handling.

Also in order to test the food mixtures under practical working hatchery conditions it was decided to use 30,000 trout fry for each experiment, 15,000 in each of the upper and lower troughs, or one unit of a battery of hatching troughs, this being about the average number raised per unit in California hatcheries.

In order to observe the full effect of each mixture the feeding was begun in each experiment with trout hatched from the eggs at each hatchery and when they were just coming up and ready to take feed, not having any other food offered them.

The experimental formulae used were as follows:

Experiment A. Thirty thousand trout in two-trough unit were fed with a mixture of 75 per cent dehydrated salmon eggs (from the Neptune Fish Products Co., Inc., Seattle[1]) and 25 per cent fresh beef liver.

Experiment B.[2] Thirty thousand trout in two-trough unit were fed with a mixture of 75 per cent sterilized sardine meal and 25 per cent fresh beef liver.

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[1] The dehydrated salmon eggs obtained from the Neptune Fish Products Company, of Seattle, are, I believe, the best product of this kind put out as a commercial product. It is well prepared and put up in air tight barrels.

[2] Bacterial counts made at the Hooper Foundation showed that ordinary sardine meal, a by-product of fish canneries, was entirely too high in bacterial content to be used with safety, hence a special lot was secured by Dr. Meyer for these experiments, and as this also showed a high content, the entire lot was sterilized under the direct observation of Dr. Van Roekel and put up in one-gallon cans, in order to avoid contamination in use by opening only one gallon at a time.

Experiment C.[3] Thirty thousand trout in two-trough unit were fed with a mixture of 75 per cent shrimp meal and 25 per cent fresh beef liver.

Experiment D.[4] Thirty thousand trout in two-trough unit were fed a mixture of dried alfalfa meal, one part; sardine meal, six parts; lactein, three parts.

Experiment E. Used as a Control. Thirty thousand trout in two trough unit were fed regular hatchery ration of fresh milk, freshly clabbered each day with rennet tablets, with fresh beef liver.

GENERAL CONDITIONS GOVERNING THE EXPERIMENTS

Brookdale Hatchery, located at Brookdale, Santa Cruz County, is a small hatchery largely used for experimental purposes, hence it was easy here to isolate the trout used in this experiment since silver salmon for another experiment were the only other fish in the building. The experiment was under the direct charge of John Marshall, foreman.

At Mt. Shasta Hatchery it was more difficult since this plant really consists of five large hatcheries. Captain Lambson, superintendent, cooperated, however, by devoting one entire small hatchery to the experiment and placing E. C. Anderson, an experienced and one of the most careful feeders, in direct charge of the experiment.

At Fort Seward Hatchery, the experimental troughs were isolated from other fish and J. C. Lewis, superintendent, took upon himself the responsibility of feeding and conducting the experiment.

The experiments were carried through to a finish at all of the above hatcheries.

At Tahoe Hatchery, owing to the late season, it was impossible to begin the experiment until July 1, and after five weeks work, it was evident that no further data was necessary and the experiment was discontinued.

It was originally intended to carry on these experiments at Mt. Whitney Hatchery, using golden trout, but by the time these were available, we had already secured sufficient data from the three hatcheries above mentioned, and consequently it was decided that it would not be necessary to conduct the experiment at this hatchery.

SECURING THE DATA

At each hatchery careful daily counts were made of the losses in each experiment and the control, all specimens of dead fish after counting being preserved in formalin in pint jars, each carefully labeled, are now on file in the laboratory of the Bureau of Fish Culture, at Sacramento. In addition to the specimens of dead fry, at the end of each week a selection of twenty-five average fry was made from each experiment, the weights taken and these are also preserved on file in our laboratory.

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[3] The shrimp meal used was such as is put up by several firms for fish food and no particular attention was paid to the bacterial content or the manner of its packing being used as it comes in sacks.

[4] The alfalfa used was the regular run of alfalfa meal as it comes from the alfalfa meal mills.

Waste: In order to use the above it was necessary to screen them for the young fry. The waste in the screening was as follows: Salmon eggs, 15%; sardine meal, 11%; shrimp meal, 60%; alfalfa, 30%. The lactein was used without screening. The lactein having a small amount of sulphuric acid in it became very sour and covered with molds very soon after opening.

Each superintendent or foreman was required to render a complete weekly report on forms provided, giving the above data in full, reports of water temperature taken three times daily, and such other notes and comments on conditions and progress of the experiments as his personal observations might suggest.

It is largely due to the faithful service rendered by the several superintendents and foremen concerned that we have on file this mass of material evidence of the experiments.

To the author was assigned the duty of frequent visits to the several hatcheries where the experiments were in progress, making observations and suggestions as they occurred to him in the conducting of the experiments and the final bringing together of the data obtained and its presentation in his report.

NOTES OF INTEREST

During the progress of the experiments the notes on observations made by the men in direct charge are very interesting and throw much light on the real effect of these rations on the fry.

Experiment A. Report of J. C. Lewis, in charge Fort Seward Hatchery.

"While these fish grew rapidly and attained a size even greater than did the control fish, they were not strong, were lacking in stamina, too rangy and had no depth. This weak condition was well evidenced in the lack of resistance exhibited during two ectoparasitic attacks which were reduced by treatment with much more difficulty and much greater loss than was the case with the control fish, which, though somewhat smaller, were more rugged and resistent to disease.

"There is no question as to the value of salmon egg meal as an addition to the hatchery ration, but it must be used in much less proportion to total food than was used in the experimenal ration. I consider it of great value if properly used, but dangerous if fed in too great quantity, this by reason of its high oil content.

"The mechanical structure of the salmon egg meal is wrong from an economic standpoint. It should be obtainable in two or more sizes as to granulation. A large proportion of it in powdered form is refused by the larger fish. We screened it through 30-mesh for advanced fry, 20-mesh for No. 1 fingerlings and 14-mesh later."

Experiment B. Report of J. C. Lewis, Fort Seward Hatchery.

"These fish, while showing a tendency to slight increase in size over normal, exhibited in a marked degree a weakened condition, lack of resistance to disease and rangy shape.

"Almost the entire sardine meal ration was refused, enough only being taken to supplement slightly the liver content of the ration.

"The condition of the fish was below that of *A* and *C* and much below that of the control fish. Observation during the term of the experiment indicates that the sardine meal is of little or no value for a growing fish ration."

Report E. C. Anderson, Mt. Shasta Hatchery:

"The sardine meal sinks to the bottom of the box so quickly that the fish do not get much of it."

Report of George E. West, Tahoe Hatchery.

"Fry eating enough to keep alive, loss heavy, no noticeable growth."

SUMMARY OF RESULTS FOR FIRST TWELVE WEEKS

Number of Dead Trout in Each Experiment at End of Week

BROOKDALE HATCHERY Average temperature 50.4°F. Steelhead trout					Mt. SHASTA HATCHERY Average temperature 50.3°F. Loch Leven trout					FORT SEWARD HATCHERY Average temperature 57.3°F. Steelhead trout					TAHOE HATCHERY Average temperature 42.7°F. Black-spotted trout				
Experiments					Experiments					Experiments					Experiments				
A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E
318	457	548	427	554	111	119	78	102	39	228	184	247	199	183	420	369	219	261	215
76	97	104	192	130	76	107	48	37	26	173	171	169	213	181	774	782	604	517	321
65	51	74	76	101	94	84	70	77	39	175	289	166	1,086	291	409	496	367	312	457
109	167	315	172	69	223	148	150	243	74	1,664	833	874	5,920	570	370	539	477	389	411
108	161	252	198	127	361	440	443	475	219	3,640	1,793	3,785	9,770	492	767	168	3,527	2,338	952
67	134	121	421	73	810	843	508	1,414	535	1,510	1,650	1,520	3,235	488	Discontinued				
457	545	101	3,055	59	1,104	787	653	224	366	644	1,318	505	3,462	100	------	------	------	------	------
3,792	2,760	267	6,143	103	1,105	882	627	3,011	532	524	3,452	231	1,303	143	------	------	------	------	------
8,236	8,592	3,229	5,834	178	1,253	1,282	876	1,873	377	321	10,091	498	150	234	------	------	------	------	------
5,404	8,259	5,717	4,724	675	1,488	1,588	1,460	1,768	179	677	5,807	4,269	*17	549	------	------	------	------	------
2,874	4,032	5,643	3,974	912	966	1,070	1,522	1,150	136	Discontinued					------	------	------	------	------
1,211	485	1,693	*826	390	820	1,421	1,608	*990	*140	------	------	------	------	------	------	------	------	------	------
22,717	26,635	18,064	30,042	3,771	8,411	8,771	8,033	13,364	2,662	7,656	25,588	11,864	24,359	3,321	2,740	2,270	5,160	3,637	2,358

*All dead.
Total average percentage of loss in all experiments: A, 40%; B, 56%; C, 32%; D, 75%; E, 8%.
Average weight in milligrams of survivors at end of experiment: A, 552 mg; B, 408 mg; C, 439 mg; D, 228 mg; Control E, 670 mg.
Amount of food fed in each experiment: A, 92 lbs; B, 81 lbs; C, 81 lbs; D, 82 lbs; E, 91 lbs.
Cost of food: Mixture A, $0.125 lb; B, $0.1325 lb; C, $0.1305 lb; D, $0.135 lb; E, $0.17 lb.
Cost of food after considering loss on each mixture: Mixture A, $0.175 lb; B, $0.2075 lb; C, $0.175 lb.; D, $0.235 lb; controls fed on regular hatchery ration: Mixture E, $0.183 per lb.

Experiment C. Report of J. C. Lewis, Fort Seward Hatchery.

"These fish attained a good size, but closely approximated the objectionable general conditions exhibited by the fish of experiment A. They were slightly better than those of experiment B.

"While a portion of the shrimp meal was refused by these fish, it proved more palatable than did the sardine meal."

Experiment D. Report of J. C. Lewis, Fort Seward Hatchery.

"This entire lot of fish starved, every fish dying. They refused the sardine and alfalfa meals and got but little nourishment from the lactein. The lactein is not stable and quickly spoils, being attacked by terrestrial molds. Its objectionable odor would condemn it and soon caused my assistants to refer to it as 'the septic-tank sludge'."

FURTHER EXPERIMENTS

In order to make full use of the fish which had been used in the experiments as already outlined at the expiration of the twelve weeks, the survivors and the controls were used for further experiments.

Fort Seward Hatchery: On July 15, Mr. Lewis was authorized to change the ration in *Experiment A* to 75 per cent liver and 25 per cent salmon eggs and to note the effect on these fish. He reported that these fish quickly recovered their "pep" and the objectionable features as to structure and condition were eliminated.

At the same time, the survivors in *Experiments B* and *C* were placed on the regular hatchery ration. These fish recovered in a measure but were much below the controls fed continuously on the regular hatchery ration.

Similar experiments were tried at Brookdale Hatchery and Mt. Shasta experimental hatchery with the same results.

Experiments with kelp (raw and cooked) and fish meal:

At the conclusion of the above experiments, the Loch Leven trout surviving at the Mt. Shasta experimental hatchery were used for experiments with kelp, both raw and cooked, mixed with liver, and fish meal (sardine meal) raw, for the period from July 30 to September 5. The losses on these several mixtures were as follows:

Mixture No. 1	Fish meal, kelp and liver	Loss 609
Mixture No. 2	Cooked kelp and liver	Loss 1308
Mixture No. 3	Raw kelp and liver	Loss 1164
Mixture No. 4	Fish meal, raw	Loss 2195

Report of Captain G. H. Lambson, superintendent, Mt. Shasta Hatchery, on the above experiments.

"There were approximately 6000 Loch Leven trout used in each of these experiments and the loss was very great, especially in the lot fed raw fish meal. One cause of this heavy loss was due to the fact that no liver was mixed with the food.

"In the lot that was fed raw kelp, fish meal and liver, the trout lived mostly on the liver portion of the feed. The same was true of the cooked kelp and liver and of the raw kelp and liver. If no liver had been used there is no doubt but that all the lots would have shown a loss equal to that of the lot fed on fish meal alone. There was another

cause of the smaller loss in the first three lots, that is, they would eat the dead fish during the time they were in the trough. The dead were removed, but the trout fry would feed upon them during the time they were in the troughs.

"There was no special control kept because all the Loch Leven trout in the other hatcheries on the grounds acted as a control and there were more dead fish in the experimental lots than in all of the other hatcheries combined.

"You will note that during the first ten or twelve days the loss in each lot was rather small, but as the experiment progressed the losses increased in spite of the fact that the number of fish in each lot was getting less and less.

"I am convinced that fish meal and kelp, in any form, is not good feed for trout. You will hear of hatcheries feeding fish meal and kelp, shrimp meal, clam meal and other foods of this kind, but always after a few days of such feed the fish begin to die and liver must be fed in order to save them. After the fish are again in good shape they are again fed the fish meals. In fact it is usually the custom to feed such feeds only a part of the time each week, liver being fed the rest of the time."

GENERAL SUMMARY

A perusal of these reports will show a number of interesting things. There are a few outstanding features, however, that are very convincing.

1. It is very evident that raw beef liver contains elements, whether vitamines or catalytic agents our biochemists and nutritional experts have not yet determined, which are necessary for the growth and general health of the young trout fry.

2. Dehydrated salmon egg meal gives promise of being a valuable supplementary trout food when mixed with raw liver in small proportions. Increasing the growth, but offers no improvement in the general condition or health of the fry. Much improvement, however, must be made in its mechanical make-up as to sizes and waste matter before it can be adopted even as a supplementary food.

3. Shrimp meal stands next to salmon egg meal as a supplementary food when mixed in small proportions with raw liver. There is considerable danger, however, in feeding this product as it is obtained from the mills. It soon takes up dampness when opened and the bacterial content increases in proportion.

4. Sardine meal (which is the constituent of most products labeled fish meal) is of hardly any value as trout food. It has such a high specific gravity that it sinks before the fish can eat it. The bacterial content is so high that thorough sterilization is necessary before it is safe to feed it at all.

5. Lactein is of no value as compared with fresh milk. It soon sours and becomes positively dangerous to the young trout fry.

6. Alfalfa, while theoretically of value because of the vitamines it contains, can not be eaten in any quantity by the trout fry for the reason that the fine powdered meal floats off before they can get it.

7. Mixtures of kelp, raw or cooked, with fish meal or liver, give the mixture a smell and taste like old blackleaf No. 40 nicotine and I

believe it has about the same effect on the fry that such a mixture would have.

8. The cost of these various mixtures is so very close to that of first-class raw beef liver that even if they were efficient it would not pay to use them.

Conclusion: That nothing has appeared in the course of these experiments that even approaches in value raw beef liver as a food for young trout.

FISH PLANTING IN THE HIGH SIERRA IN 1929

By O. P. Brownlow

One of the duties of the Division of Fish and Game is to endeavor as far as possible to maintain an adequate supply of fish in the waters of the state. With the improvement of old roads and the building of new ones into hitherto inaccessible areas, this function has assumed the nature of a problem and one becoming more serious every year. Unless every effort is put forth to see that all water suitable for trout is planted in the very near future, the problem will be most difficult to solve.

Realizing this, Chief of Patrol E. L. Macaulay recommended that the work started in 1928 of catching and transplanting golden trout be continued until all waters suitable for this variety of fish were properly stocked. It is to be hoped that this work will progress so when these now inaccessible areas are open to automobile and airplane travel, vacationists will find an abundant supply of fish awaiting their arrival.

On July 1, 1929, Deputy F. A. Bullard left General Grant Park for the North Fork of Kings River with an efficient crew and a pack train of seventeen animals. Arrangements had been made with the Fresno Sportsmen's Club for the delivery of 10,000 rainbow fry from the Kings River Hatchery. From this supply, twelve plants were made stocking the barren waters at the head of Blue Canyon and Alpine Creek, both tributaries of the Middle Fork of Kings River.

Operations were immediately started to gather adult trout from the nearby streams and transplant them into other barren waters. After all streams and lakes in this district had been planted the party moved into Bench Valley where four plants were made. They then went to the head of Fleming Creek where six plants were made. From this point, camp was moved into Evolution Valley where one of the most important plants was made. This was at the head of Goddard Creek, a beautiful stream with many lakes, but all barren of game fish.

A quotation from the diary which describes the trip into a lake at the head of Goddard Creek will bear out the trials and commendable nature of the work: "July 25, 1929, left camp 6 a.m. with one mule and 70 rainbow trout. In two hours were at the end of the trail. With pack cans on our backs we hiked eight hours, making trip to lake and back. Spawning conditions good. This plant should stock twelve to fourteen miles of creek and several lakes. Country very rough; no trails. To camp at 8 p.m."

In gaining the full significance of this one should consider that a pack-can with water and fish weighs about fifty pounds. Only loyalty to the division and a desire to assure future sportsmen who wish to go

FIG. 1. One of six plants of adult golden trout made at the head of Fleming Creek, a tributary of the North Fork of the Kings River, Fresno County, California. Photo by F. A. Bullard, July, 1929.

FIG. 2. Pack train laden with adult golden trout negotiating Hell for Sure Pass, 11,833 feet above sea level between the headwaters of Fleming Creek and Goddard Canyon, Fresno County, California. Photo by F. A. Bullard, July, 1929.

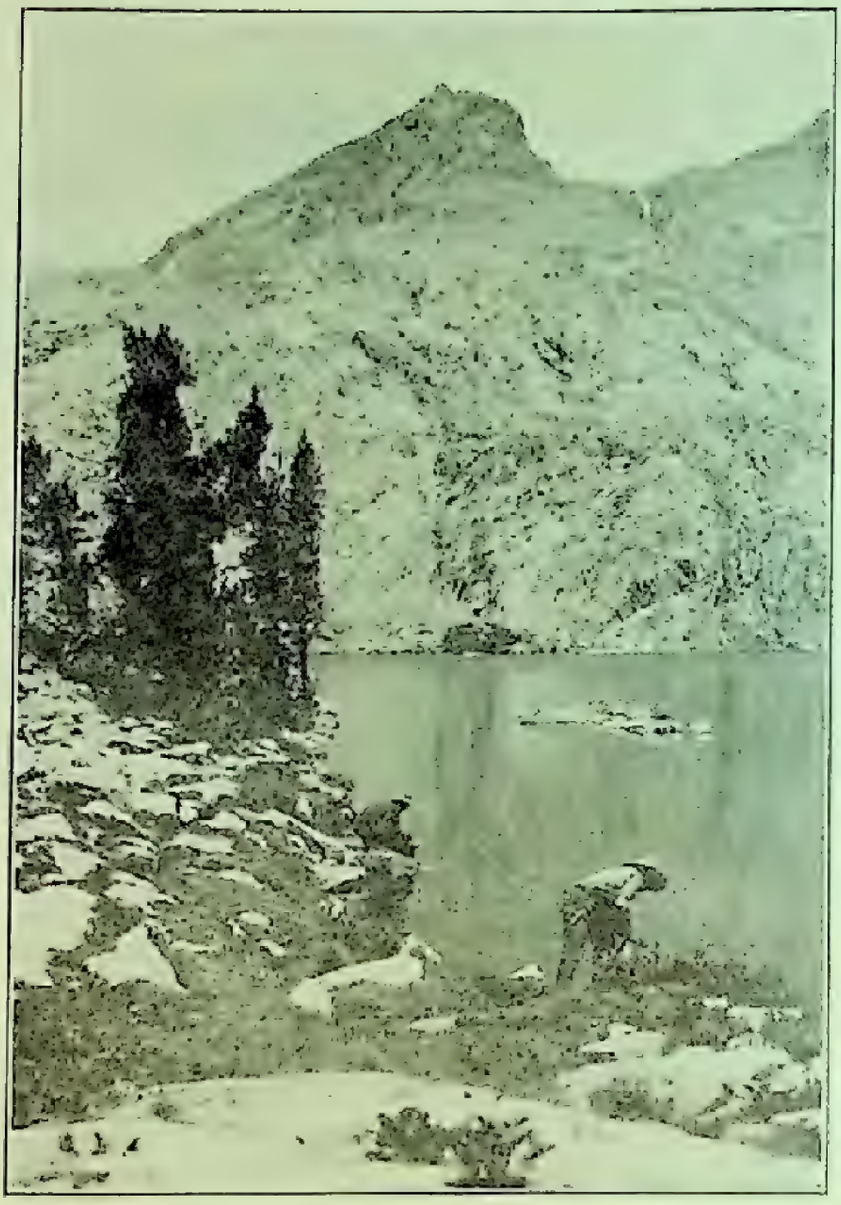

FIG. 3. Extending the range of golden trout to the headwaters of Goddard Creek, Fresno County, California. Photo by F. A. Bullard, July, 1929.

into the Alps of America for a basket of fish, can explain the motives that prompted these men to pack a can of fish on their backs through snow and over rocks for four hours.

On account of shortage of horse feed, it was necessary continually to move camps. Plants were made in lakes in Evolution Valley before the crew moved to Cartridge Creek. Here some very beautiful lakes and streams were stocked. Camp was next located in the Upper Basin of the South Fork of the Kings River. From here twenty-five plants were made. It was necessary to hasten the ten plants made in Vidette and Center Basin because horse feed was especially scarce. The last camp was in Cloudy Canyon, a tributary of Roaring River. After Five Lakes were planted, the party returned to General Grant National Park after being out fifty-seven days. During this time eighty-two plants were made, comprising 10,000 rainbow trout fry, 1073 adult rainbow trout, 65 adult Loch Leven and 3475 adult golden trout. A total of 14,615 trout were handled.

FIG. 4. A network of barren lakes and streams were stocked with golden trout in the granite basins below Cartridge Pass, Fresno County, California. Photo by F. A. Bullard, July, 1929.

FIG. 5. Pack train with golden trout laboring over the celebrated Muir Pass, 12,059 feet above sea level, and the only trail across the Goddard Divide, Fresno County, California. Photo by F. A. Bullard, July, 1929.

In 1928, 8350 golden trout were planted in 106 places. The 1929 plants bring the grand total to 22,963. Most of these trout were large enough to spawn. There is every reason to believe that within a reasonable time, much of these once vacant waters will be teeming with gamey trout.

The headwaters of the Kings and San Joaquin rivers are a vast network of lakes and small streams. Hence, stocking at this time is of special value, for nearly all of the streams and lakes planted are away from the main traveled trails and the fish will have a chance to increase unmolested. Before roads penetrate the area, the fish will have opportunity to become established. The tourist, instead of finding barren waters, will be greeted by flashes of rainbow or golden trout as they dart into deep pools or under mossy banks.

FIG. 6. Packing golden trout to Tunemah Lake, a tributary of Goddard Creek, Fresno County, California. Tunemah is a Chinese imprecation of disgust descriptive of this rough country. Photo by F. A. Bullard, July, 1929.

CONSERVATION LAWS PROVIDE AMPLE PROTECTION FOR ABALONES

By N. B. Scofield, in charge of Bureau of Commercial Fisheries

The conservation laws protecting abalones south of Monterey against depletion by commercial fishermen are ideal, and the fear expressed by sportsmen in San Luis Obispo County that abalones will be exterminated in the Point Buchon-Pico Creek district recently thrown open are not well founded. In fact, the commercial taking of abalones in that district will have no effect on the supply drawn on by amateurs.

If the facts were only known, there should be absolutely no conflict between the amateur, or sportsman, and the commercial fisherman. The red abalone, the only one which can be taken commercially, was for years the subject of study and investigation by Dr. Harold Heath, of Stanford University, and by others working under him, and as a result a great deal is known about its life history. The following facts can be easily verified.

The law provides that for commercial fishermen the shell of the abalone must be not less than 8 inches in diameter, and a red abalone of this size is about ten years old. The commercial fishermen are not permitted to take abalones from the rocks along the shore which is reserved for amateurs, and all must agree that an 8-inch abalone in this reserved area would be a great rarity. The amateur is allowed to take any red abalone which is 7 inches or larger. The commercial fisherman, like the amateur, must bring his abalones ashore in the shell in order that the size can be measured. He can be easily watched, for he must bring them ashore where there is equipment to slice and prepare them for market. All landings of commercial abalones at Monterey, the seat of the industry, are watched and inspected by deputies of the Division of Fish and Game. It is not so easy to watch the amateur and it is safe to say that many abalones under 7 inches are taken by amateurs, knowingly as well as unknowingly.

A 7-inch red abalone has had three or four years of reproduction. The following is quoted from a statement made by Dr. Heath a number of years ago:

"The eggs measure about one one-hundredth of an inch in diameter, and about two million eggs are liberated each year from every large female abalone. An abalone recently examined, measuring eighteen and one-quarter inches in circumference," (less than 7 inches in diameter) "contained 1,303,128 eggs. The size of shells taken by commercial fishermen show that most of them have six or seven years of reproductive activity before they pass the legal limits of protection. This means that each abalone has deposited from one to twelve million eggs. The spawning season for red abalones is between February 15 and April 1. The spawn when liberated rise to the surface of the water and are carried by wind and tide, miles in extent, until fertilized. After the first stages of development the eggs sink and become attached to seaweed, where the young abalones start in life. They remain practically in the same place during life, and consequently there are millions of abalones in water too deep for diving, and under rocks which are

inaccessible. About half of the ocean bed is covered with huge rocks between which and under which a diver can not go.

"The life of the abalone is dependent principally upon the amount of seaweed" (which is their food) "and, as this is practically inexhaustible, there is a very remote possibility indeed that the shell fish will ever become extinct."

Since Dr. Heath made this statement the minimum commercial size has been raised from 7 inches to 8 inches and the area inside a line twenty feet beyond extreme low tide line has been reserved for amateurs, who are permitted to take as small as 7-inch abalones. The 7-inch limit was sufficient protection, even for the commercial fishermen, but the industry preferred the larger ones, so at their request the commercial size was raised.

Commercial abalones are taken by means of diving equipment and there should be no legislation against this method, as it is the proper method and keeps the professionals well outside the area reserved for the sportsmen, for a diver can not work in shallow water on account of the surging of the swells. The diver never goes in water as deep as 100 feet, for it is difficult and uneconomical to work at such a depth. Abalones are found well outside this depth, at least to the 300-foot line. There is therefore a large area in deep water, as well as an area inshore, and the inaccessible places under and between rocks in depths where the diver goes, in which abalones can live out their long lives in peace and each spring liberate their myriads of eggs to repopulate any bare spots on the rocks to which they can cling. Added to this are the further millions spawned by the abalones, in the fished area, which have reached maturity but are protected by the 8-inch size restriction. We can not say as much for the area reserved for amateurs, although even there are found many mature spawning individuals 7 inches and less in diameter. Due to the very slow growth, it is easy for those gathering abalones for sport to keep the rocks pretty well denuded of the legal sizes.

The public demand for sliced abalone has grown until it has become increasingly difficult to supply this demand with the 8-inch abalones available in the region near Monterey. For that reason the area in San Luis Obispo County was opened. If in one season all the 8-inch abalones are taken, there will be no cause for alarm, for the fishermen can not take them under that size. They will simply have to wait until those below 8 inches pass the size limit, as they have been doing in the vicinity of Monterey. The production will be limited to the yearly crop of individuals which reach the 8-inch limit. In other words, they will be drawing only the interest and leaving the principal untouched.

It has been argued that if commercial fishermen would not take abalones in the deep water they would move inshore and replace those taken by the amateurs. This argument was first used when the commercial limit was 7 inches, the same as the amateur limit. It has lost what value it may have had as an argument since the commercial limit was raised to 8 inches, for if there were such a movement, there should be plenty for the amateurs measuring between 7 and 8 inches. The extreme scarcity of individuals even approaching 8 inches on rocks along the shore is sufficient evidence that there is no such general migration. It is known that most of the individuals cling to one spot on the rocks throughout their lives. They are able to move about but do not do so

unless compelled to by the encroachment of shifting sand due to bad storms. At such times most of those which lose their hold are washed ashore.

Conservation in its broadest sense means to utilize a natural resource to the fullest extent possible without endangering the source of supply. This is what is being done with abalones in District 18, at least in so far as the commercial fishing is concerned. The abalones are so well protected in deep water, that there is no great cause to worry, even if the amateur can not be controlled and he permits none of the individuals in the area reserved to his exclusive use to reach the spawning age.

ABALONES IN CALIFORNIA

By Paul Bonnot

In the early days in California there was an abundance of natural food resources and the white population, for the most part, overlooked the lowly abalone. The abalones in those days were comparatively plentiful. The Chinese population, however, inured for centuries to utilize every available possibility which promised any nourishment, had long known and used the abalone in their own country, and viewed the teeming, wave-washed rocks of the California coast with gustatory and mercenary satisfaction. The abalones were dried in great quantities and sent to China. In accord with the reckless disregard always shown a newly discovered natural resource, the Orientals took any and all abalones they could obtain. I find a protest against the unrestricted "fishing" of abalones in 1900:

"The continued gathering or 'fishing' of abalones (Haliotis, Earshells or Ormers, as they are variously called) along the coast of California has recently led to restrictive action by some of the county authorities. The supervisors of Monterey, and of other of the seaboard counties, have taken the necessary legal steps to regulate the fishing, which has been carried on continuously from about 1864 to the present time by the Chinese, and of late by the Japanese. The well known species *Haliotis rufescens* and *H. cracherodii*, so abundant between tide marks a few years ago, have, owing to the unintermittent collecting by the Asiatic fishermen, become comparatively scarce. An ordinance recently passed by the authorities of Monterey County makes it unlawful to 'fish' for abalones except in deep water, and by means of diving apparatus or other deep sea device. A license of $60 is also to be charged in the future for 'fishing' for abalones (presumably for one year)."*

The canning of abalones in California started about 1905 at Cayucas. In 1917 there were five plants canning abalones. In 1921 there were three; one of these was at East San Pedro and the other two were at Monterey. Until 1928 a cannery operated in Carmel Bay. At the present time, there is no canning of abalones in California.

The drying of abalones has been prohibited in California since 1915. They are utilized only in the fresh state at present. The red abalone (*Haliotis rufescens*) is the only species of commercial importance.

* Abalone Fishery in California Protective Regulation. R. E. C. Stearn. *Nautilus*: Vol. XIII, p. 81, 1900.

FIG. 7. Point Lobos Canning Company at Carmel Bay. This cannery packed abalones until 1927.

The minimum legal size for commercial use is eight inches in diameter.

From time to time there develops opposition to the commercial fishing of abalones. The proponents of this opposition are under the impression that the abalones are being "fished out." I quote here a statement from CALIFORNIA FISH AND GAME, Vol. 11, 1925, page 138, by Dr. Harold Heath, of Stanford University. "The red abalone extend in such an abundant quantity along the coast of Monterey and San Luis Obispo counties, that it would be impossible to materially reduce their number, as they live in water beyond the depth to which a hunter can go; and their habits and methods of propagation are such that the spawn would immediately repopulate a district if it could be fished out, which, however, is impossible, as the law protects abalones under nineteen inches in circumference. An abalone of this size, nineteen inches, has had three or four years of reproduction. The eggs measure about one one-hundredth of an inch in diameter, and about two million eggs are liberated each year from every large female abalone. * * * The spawning season for red abalone is between February 15th and April 1st. * * * The life of the abalone is dependent principally upon the amount of seaweed, and as this is practically inexhaustible, there is a very remote possibility indeed that the shell fish will ever become extinct. For hundreds of years abalone, the pearl oyster and other like animals of commercial value have been collected in various parts of the world and the industry goes on today."

METHODS OF PRESENT FISHERY

The present fishery for abalones is, roughly, an area between Point Pinos, Monterey County, and Point Buchon, San Luis Obispo County.

Fig. 8. Abalones drying at Cayucas, August 2, 1913. A pile of shell in the background.

The fishing crews which collect the abalones today are almost entirely Japanese. A boat from fifty to sixty-five feet in length is used as a base, having living quarters for the crew of five men. A smaller boat, containing the diving rig, a small stationary gas engine, pump and air tank, is towed by the larger boat. Having reached the desired place, the large boat is anchored a quarter of a mile off shore. The diver and three men embark in the smaller boat. This is manipulated by means of a long oar which is worked over a single upright wooden peg at the stern. By a sculling movement of this thin bladed oar, the boatman handles the boat perfectly, even working astern with apparently no change in the movements of the oar. The diver usually works in comparatively shallow water. He walks about and pries the abalones from the rocks with a short flat piece of iron. He carries a net bag into which he drops them, and when this is full, a signal on the line causes the line tender to draw it up on deck. The diver draws the bag back, coiling up the line in his left hand. The boat follows the diver about, in some places a rather hazardous business. The sea surges and breaks on the rocks, throwing the small boat about and sucking it in and out of narrow crevices. The diver draws good pay—and earns it. The boatmen get ordinary wages.

The abalones are sorted and measured as soon as they are dumped on deck. The desirable ones are piled in the hold. When a load has been collected, it is conveyed to the larger boat. Here, on the flat aft deck, wet sacking is laid down and the abalones stacked in a slanting position. As soon as the foot of one animal touches the shell of the next, it fastens to it, and the solid, flat cargo is thus arranged. When a load of 200 or 300 dozen abalones is on deck, the boat starts for

Monterey. An element of time enters in, as the abalones must be landed alive. They keep well, however, and will last for four or five days.

At the docks, the mollusks are unloaded and piled up on the floors of the fish houses, and the dressing crews are assembled. The abalone is removed from the shell with a flat, stiff, pointed piece of iron. An automobile spring leaf is an admirable tool. This is pushed up to the base of the muscle where it adheres to the shell, and the iron driven downward. The shells are thrown to one side and the abalones are thrown into a slatted box and washed. Several women then remove the viscera, trim the edges and wash the muscle carefully. The cleaned muscle is then put into a hand cutter, similar to the present day prepared meat slicers found in most butcher shops. This machine slices the abalone into round slices, half an inch thick. These are roughly sorted by size and are taken to the beating tables. There the slice of abalone is placed on a block of wood and beaten with a wooden mallet. Some skill seems to be required here, as a too heavy beating results in a pasty mass, and too light a one leave portions as tough as leather. The finished product is packed in five and ten pound wooden boxes and either shipped at once or put in the ice box.

The shells are not utilized to any great extent at present. A few years ago there was a popular demand for jewelry made from the different kinds of abalone. Tourists bought immense quantities of this jewelry, and also the shells, to take back to eastern friends. The California manufacturers of articles from abalone shells had a law enacted forbidding the shipment of the shell out of the state. Only finished products manufactured from abalone shells could be legally taken or shipped to outside points. The financial return apparently did not justify this action. The demand for abalone shell jewelry has become very small and tons of shell accumulated which can not be shipped.

ABALONES TAKEN COMMERCIALLY IN CALIFORNIA

	January, February and March	*April, May and June*	*July, August and Sept.*	*October November and Dec.*	*Total (pounds)*	*Total (dozen)*
1918	84,440	147,714	95,345	151,971	149,470	2,989
1919	66,336	185,738	331,509	175,620	759,203	15,184
1920	43,450	225,268	314,711	223,287	806,716	16,134
1921	252,006	421,357	538,855	268,952	1,141,170	22,823
1922	199,950	449,357	660,316	213,771	1,523,394	30,467
1923	88,042	549,579	557,289	360,221	1,555,134	31,102
1924	188,302	801,882	697,323	554,305	2,241,812	44,836
1925	172,508	693,877	882,996	603,480	2,352,861	47,057
1926	105,766	654,263	916,272	384,469	2,060,770	41,215
1927	307,168	881,948	917,513	709,901	2,816,530	56,350
1928	123,481	801,517	815,536	325,709	2,066,243	41,324

(From statistics compiled by Bureau of Commercial Fisheries, Division of Fish and Game.)

SPECIES OF ABALONE FOUND IN CALIFORNIA

Green Abalone (*Haliotis fulgens*) Phil.

The green abalone is not found, to any extent, north of Point Conception. It inhabits a zone from low tide limit to a depth of ten fathoms. Green is the predominating tint among the iridescent colors on the inside of the shell. There are generally six holes open. The shell seems to be especially subject to boring worms that honey-comb it with burrows.

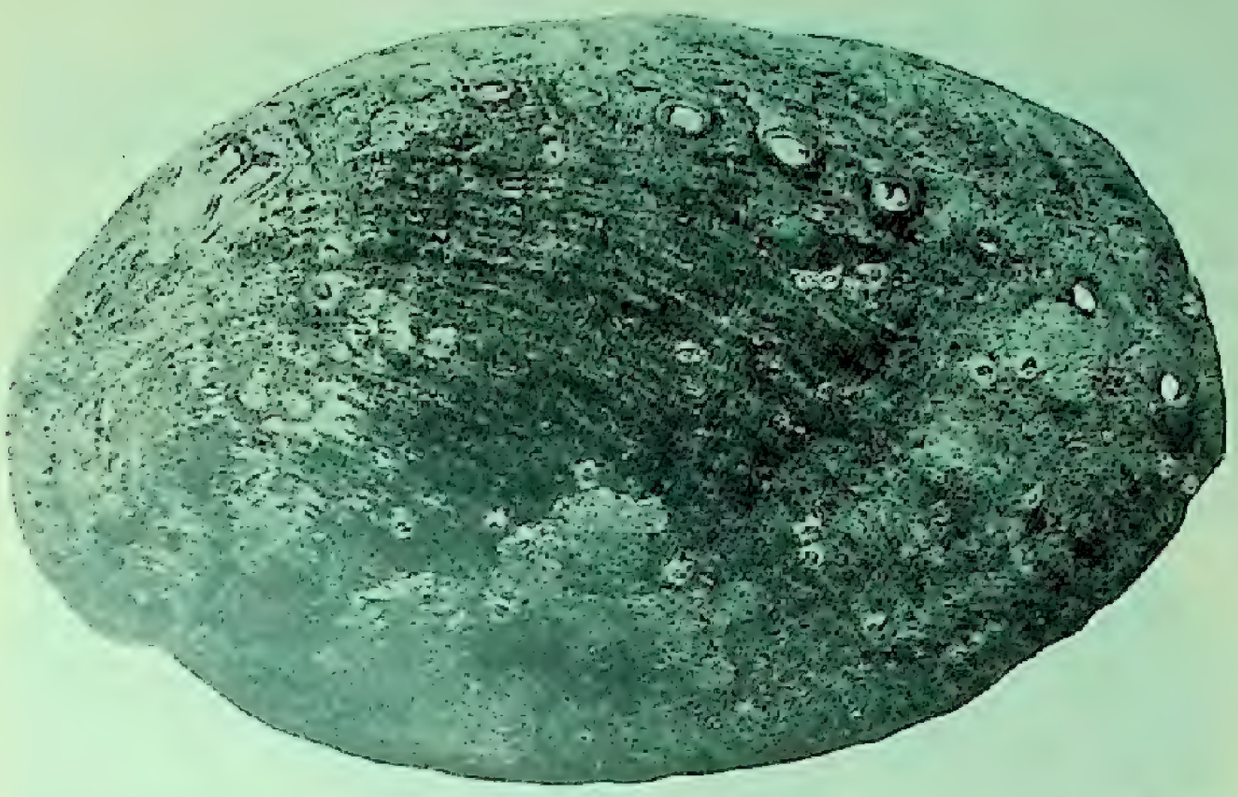

FIG. 9. Northern green abalone (*Haliotis wallalensis* Stearns), from Abalone Point near Westport, California. Length 4⅜ inches. Photo by W. F. Thompson.

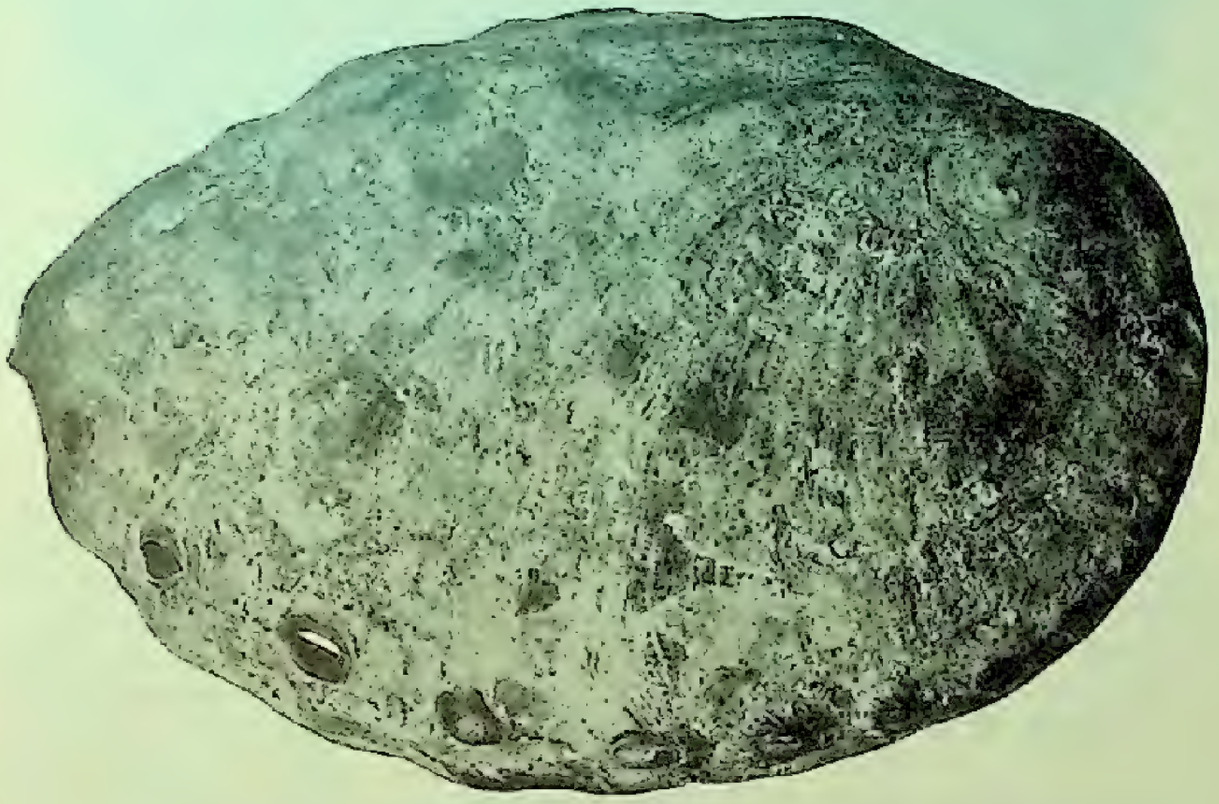

FIG. 10. Red abalone (*Haliotis rufescens* Swainson), from Crescent City, California. Length 8½ inches. Photo by W. F. Thompson.

The green abalone was the basis for the Japanese fishery in southern California and northern Mexico for many years. Though still fairly abundant, they are now nowhere found in the vast numbers which once lived about the Channel Islands.

Red Abalone (*Haliotis rufescens*) Swains.

The red abalone is readily recognizable. It is a dull brick red on the outside. There are usually four large holes open, with a range from one to five. The texture of the shell is hard and brittle.

The red abalone is found in California from San Francisco to Mexico. It is the abalone which is taken near Monterey as the basis of the present day fishery.

FIG. 11. Black abalone (*Haliotis cracherodii* Leach), from Point Arena, California, Length 6¼ inches. Photo by W. F. Thompson.

Black Abalone (*Haliotis cracherodii*) Leach.

The outside of the shell of this abalone is a bluish black and is more or less smooth. The inside is pearl colored and iridescent. For some reason, the black abalone does not support the growth of marine life which is found on the shells of the other abalones. This species is smaller and inferior in flavor to the other abalones, and is not used for food to any extent. They seem to favor rocks which are not so covered with algae. In favorable locations, they occur in great numbers. I have seen them on San Miguel Island, exposed at low tide, in such quantities that a thousand could have been collected in an hour.

Corrugated Abalone (*Haliotis corrugata*) Gray

This is generally called the pink abalone. It resembles the red. The back of the shell is fluted or corrugated and there are only two or three holes open. It inhabits the same range and environment as the green abalone, but is not now found in large numbers anywhere.

Threaded Abalone (*Haliotis assimilis*) Dall.

The shell of this species is thick and compact. The inside is silvery, while the back is reddish and traced with fine striations. It is found in deep water, from Monterey to San Diego.

Japanese Abalone (*Haliotis gigantea*) Chem.

This species is a migrant from Japan by way of Bering Strait. It is supposed to range from the northern California line to central California. The shell is elongated and has a prominent spire. There are four open holes. The inside is pearl colored and iridescent. Despite its name, it is one of the smaller species. It is very rarely collected.

Fig. 12. The Alaska white abalone. Photo by S. S. Berry.

LIFE HISTORY NOTES

The abalones have an ancient lineage. They are found imbedded in ancient sea bottoms as far back as the Paleozoic. Abalones are not found on the Atlantic coast of North America or anywhere in South America. They are found on the west coast of Europe and on the Pacific coast from Cape San Lucas to Alaska. They occur along the Pacific coast of Asia.

The present habitat is fairly restricted. They are found to the upper limit of high tides and from that point into fairly deep water. The record, I think, is forty fathoms. Several specimens were taken some years ago at that depth by a drag boat from Santa Cruz, California.

The young abalones are preyed upon by starfish of various species and some few fish, the bullhead (*Scopeanichthys*) being the worst. The starfish can lift even a medium sized abalone sufficiently to get its stomach under the shell. The bullhead swallows small abalones whole, and having digested everything but the shell, regurgitates that.

Fresh water is quickly fatal to abalones. In some few places, where large fresh water streams empty into the ocean, numbers of the mollusks are killed during periods of heavy freshets.

The adult abalones move about very little. Colonies are sometimes found on isolated reefs which are surrounded by sand. A shifting of ocean currents causes the sand to shift to such an extent that it sometimes covers such reefs. In such cases, the abalones are doomed—once loose from the solid rock, they are helpless. On sand, they can get no purchase and are quickly smothered.

The abalone feeds on sea lettuce, eel grass, different species of rock kelps and diatoms. Being a true snail, the radula is present, which facilitates the utilization of this type of food material. The radula is a thin, ribbon-shaped organ, comparable to the tongue. On its surface are a series of hard protuberances. The radula is rasped back and forth against the food material, "filing" it off in very small pieces. Some species seem to live on floating forms of vegetation more than others. The black abalones appear to exist altogether on diatoms.

Red abalones reach the breeding age at about six years. At that age, they are approximately four inches in diameter. The female is capable of producing 100,000 eggs during the first breeding year. It has been found that a six-inch abalone contained 1,303,000 eggs and a seven-inch abalone contained 2,407,000 eggs. The spawning period is from February to the middle of April. The young move about freely but very soon settle in some one locality and, unless forced out by natural causes, stay in approximately the same place for the remainder of their lives.

*Red Abalone—Comparison of Age to Size**

Age	*Size—Diameter inches*
1	1.20
2	1.60
3	2.15
4	2.94
5	3.78
6	4.37
7	5.38
8	5.50
9	6.00
10	6.25
11	6.60
12	7.80
13	8.00

* Observations on the Growth and Habits of the Red and Black Abalone. W. W. Curtner. Master's thesis, Stanford Univ., May, 1917.

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In compiling a bibliography with which to start the present paper, I at once encountered the fact that very little has been written about the abalone. There are several highly technical papers, relating to various aspects of anatomy, which would not interest the average

reader. The following references are the only ones I have been able to find which are at all obtainable and which do not deal too technically with the subject.

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SEEN KOW

A Regal Soup-Stock[1]

By Geo. Roger Chute

(With eleven photographs by the author)

(Editor's Note: This article is a sequel to the account entitled "The Totuava Fishery of the California Gulf," published in the October, 1928, issue of this magazine. In the previous writing the author related the history of the fishery, traced its remarkable growth, and described in detail the striking methods employed in the fishing and in the transportation of the catch across hot deserts to a market hundreds of miles away.)

The Chinese national thirst for soup must be an appalling thing. The ends to which those people go in quest of gelatinous substances from which to boil thick and opaque fluids for fancy first dinner courses exceeds the ardor of that fabled ancient who hunted with a blunderbuss for materials for a humming bird pie. But to a better understanding of this matter, come with me to Mexico:

Here we stand on the beach at San Felipe.[2] The canoes are coming in, for it is mid-afternoon; the *pescadores* are homeward bound on the inshore breeze. Many of the hardwood dugouts are driven forward by broad paddles swung in unison by their crews of three or four, but a few carry mast and sail and scoon along so smoothly as to leave neither wake nor ripple. These drive almost upon the beach before their men spring up, by a few swift moves cause the canvas to collapse, and then with a deft turn or two furl boom, sprit, and cotton into a neat, compact roll convenient for stowing across the thwarts, close along the rail.

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[1] Contribution No. 85 from the California State Fisheries Laboratory, August, 1929.
[2] San Felipe, Baja California, Mexico. A fishing camp, southeast from Calexico and Mexical, 136 to 167 miles—depending on which of two possible routes the water-stage of the Rio Colorado chances to permit of being traveled.

FIG. 13. Originally only dug-out canoes were employed in the fishing. These came from Banderas Bay, in Jalisco state, and were made from *alamo* (poplar), *cedro* (cedar), or from an enormous jungle tree called *huanacoxtl*. Canoes 20, 30, or even 40 years old still are in service. Last year (1928) American-type skiffs made their appearance, and recently gasoline-engined craft have been introduced, with outstanding success.

FIG. 14. A plank skiff and two log canoes. The beheading ax stuck upright in the sand. The fishermen are unloading and dressing their catch of Totuava preparatory to selling the flesh to truck drivers, who are distinguishable by their shoes, hats, and by being dry. The Totuava is the largest of all the croaker genus; it is related to the California kingfish, queenfish, common croaker, spot-fin croaker, "roncador," white sea bass and corbina, as well as to various Atlantic forms—particularly the squeteague or weak-fish.

So fascinating is the spectacle of skilled canoemanship that one fails to note the forward progression of the craft until the hissing of sand beneath keel-less bottoms arouses one to the realization that the boats are ashore. The fishermen leap out, and with the assistance of ever-present groups of onlookers drag the canoes' heads high enough to hold.

One would never suppose that a dugout could freight such a quantity of fish. Within the vessels are row upon row of great, silvery bass. They are truly tremendous—sometimes larger than their captors. Twenty, forty, even sixty fish, each of them averaging a hundred pounds. Three tons is a big fare to be buoyed in from sea in the hollowed trunk of a jungle tree.

"¿Cuantos, Pancho?" ("How many, Frank?") asks a soft-voiced Indian on the beach.

"Muchos" ("Many"), responds a canoe captain, for he actually does not know—he has not yet taken trouble to count the catch!

The tide is on the ebb. Each receding wave leaves the stranded dugouts higher upon the sand. Dogs, children and fish-buyers gather to view the fares, and then the boatmen throw out the catch, the great, inert forms making a prodigious splash as they fall into the thin water alongside. Flying drops of brine provoke the children to excited squeals and laughter; the dogs bark.

We now approach the matter of soup, for the time has come to dress the fish. These are dragged away from the canoes, arranged in rows with heads up hill, all lying on the same side. Comes the beheader with an old axe, wherewith he hews through the spine of each in turn, severing the massive vertebrae close behind the heads. Another of the crew, having meanwhile whetted up a butchering knife, commences the ripping of bellies and drawing of the fish. Here we see a second display of dexterity, for although the blade is plied with seeming carelessness, the viscera is never injured, and the big, glossy swim-bladder, white and satiny as new taffy, is drawn forth entirely whole, and with the long attached ducts uncut.

With evident solicitude the fisherman lays this organ down; he folds the streamer-like ducts across it; he covers it with sand as a protection against flies and dogs; he guards it from the trampling feet of heedless youngsters.

"¡Cuidado con los buches!" (Look out for the buches!), he calls to an approaching stampede of romping chocolate children. Like plovers swerving from a gunshot, the race and pursuit slants off in a new direction, for every child of the fishing camp recognizes buche as money—as the thing for which his father rises in the dawn each day to paddle to sea to get.

Now the business of fish-dressing is completed. The crews sell the carcasses to truck-driving fish-buyers, and carry the bodies across the wide beach to where the automobiles stand waiting for their freight. The looms of long ash sweeps are thrust through the gill openings of whatever small fish have not been beheaded, and through the abdominal slit and under the uncut collar bone of the larger specimens; two men then bear the burden along, the fish swinging pendant between them. Having delivered the catch to the trucks, their obligations as vendors

are fulfilled, and the canoemen return to the beach to unearth the interred buches. These they rinse in the sea, and carry away with them to their *jacales*: brush-thatch homes.

More often than not the preparation of the buches falls to the lot of women. Usually it is the wife; sometimes an elder daughter is entrusted with this consequential function. Only if the man be a bachelor does he "make the buche" himself.

FIG. 15. "La Parapera" or camp tender, the young daughter of a fisherman making buche. The sounds are soaked in sea water several hours before treatment, that they may relax their tissues. A chief feature of the dressing is the repeated washings and the thorough scraping given each sound. This buche-making outfit was the most complete in the camp. The little Señorita is especially attired, she having held up the photography for sufficient time to rush indoors for her mother's black *reboso*. Note the skilled workmanship in the construction of the *jacal*, *palo Adán* rods having been used to bind the thatch of fine-stemmed desert brush.

From out of obscure corners, from off the roof, and from under beds and bundles, the woman conjures up the paraphernalia for her task: a canned milk box, a section of plank, perhaps a tub or some five-gallon oil tins fashioned to taste, and an old case knife or similar blade to serve as tool. Seated on the sand—usually in the entrance of the hut—she begins the careful preparation of what will eventually become Chinese soup. She scrapes each buche entirely clean. Adhering tissue, mucuous-like exudings, traces of blood clots, particles of sand—all this is removed with meticulous care. Then the collapsed bladder is spread flat upon the working board; it is ripped along one side and opened out in an oval sheet of but a single thickness. Finally it is taken to a sun rack and arranged there to dry.

These sun racks merit attention. Most of them are made of the peeled rods of the thorn-ribbed desert shrub called *ocotillo* or *palo Adán*,[3]

FIG. 16. Buche-camp of five Mexican bachelors. In this instance the *jacal* is a mere makeshift shelter, carelessly constructed. The catholic utility of the *palo Adán* is well displayed here, where the structural frame of the dwelling, the outdoor cupboard, the tent support, and the buche-rack all are built of it. The dry-rack is of especial interest, since it is one of those made of cotton netting used to receive the buches fresh from the cleaning. The new, white buches here seen have been exposed to the sun less than one day.

according to the place of nativity of the speaker. The *palo Adán* is the chief dependence of the fisherfolk for structural stock, be the object a house, bed, goat pen, table, oar stand, or drying rack. Its long, cane-like poles, occasionally forked, offer the best and only building material which the country affords other than the ever-present adobe, and the stones of the earth itself.

But a fresh buche is never spread upon a drying rack of poles. To do so would result in marking it forever with corrugations, lessening its value. The first exposure to the sun is therefore made upon a sort of hammock, shaped from a section of fish-net webbing swung

[3] "Adam's tree"—it is entirely leafless!

between supporting uprights. During the first day the buche is turned several times, that it may dry equally from both sides, not become curved or convexed, and bear no deep imprints showing where it had rested upon the cords of the net.

In the absence of webbing with which to fashion a sun rack such as that just describe, sometimes a ripped-up gunny sack is made to serve. Strips of canvas will do, although they impede dehydration from the bottom surface of the sound. In a few instances bits of poultry netting have been substituted for the softer and better cotton mesh, and in at least one case a poor fisherman, who had no means whatever with which to procure even a section of chicken wire for making his dryer, dragged his blankets down upon the ground and spread his precious buches upon the wire springs of the cot-bed which his American employer had doled out for his comfort.

FIG. 17. In the immediate foreground is a pole rack for receiving the buches after they have first been hardened and about half dried on the cotton-webbing rack seen on the left, near the girls. The slabs lying upon the pile of *palo Adán* poles on the ground are not buches, but the sun-dried flesh of Totuava. This is stored by the provident fishermen for carrying back to the Mexican main when the family makes its annual summer return to the beloved home port of Guaymas or Mazatlán.

By the morning of the second day the buche has become quite firm, it has lost appreciably in weight, and the color has changed from the brilliant dense white of chilled lard to a semitranslucent, tea-colored glassiness such as characterizes cooked gristle and Idaho agates. No longer subject to receiving impressions, it is transferred to a pole rack where in two days more—or at most only three—it becomes flinty and eternally imperishable.

A fisherman may amass and hoard his wealth in his dwelling. He may cord it up along the wall of his sleeping quarters, or stow it away in out-of-the-way nooks and recesses, packed in bags or bound into convenient bales. On the other hand, he may take it to a buche-buyer

who will weigh each piece and pay him according to a scale known to all, giving him silver, gold or currency, American or Mexican, according to what his wishes and preferences may be, and according to whether or not he is willing to sacrifice high percentages in demanding gold, or other stable money. Thirdly, he may elect to live well, and so carry his buche to the oriental merchant of the camp, exchanging it there immediately for canned stuffs and bulk foods on a basis of the weight of each separate sound. Most follow the latter course, being philosophers, for who knows but that tomorrow one may die, and of what use is hoarded buche to a dead man?

The Chinese buy it all. Oriental storekeepers at the camp get some of it; Chinese buche-buyers, or Mexican representatives in the employ of these, acquire the bulk of the output by direct purchase for cash; small quantities find their way clear to the border and are there marketed for a medium of exchange, or bartered directly for beer and whatever else the fisherman may fancy. Stray lots of buche trickle in to the Chinese broker at the boundary from all manner of unguessed sources. It really astonishes one to see through what channels a money travels.

But eventually the Chinese get it all. Whatever quantities reach the border are shipped to San Francisco. By far the larger amount is baled at the camp, tied with wire, covered with burlap, sent by water to Quaymas and transshipped from there to San Francisco. Reunited in the city of the Golden Gate, the overland and water-route lots are forwarded to Chinese metropolitan centers—especially to Pekin, Shanghai, Canton and Hong Kong. Of the ultimate market we know little.

From the moment a Chinese buys a dried fish sound from an Indian or Mexican, the buche is buche no longer. It then changes nationality and becomes Seen Kow, Sing Kow, San Kow, or even Yee Kow, according to the pronunciation accorded the written characters by whatever dialect your particular Chinese may happen to speak. He prizes it as a delicacy of the first order, and like our own Thanksgiving turkey or Christmas goose it stalks as a principal figure across the menue of the one great Oriental holiday—the Chinese New Year celebration.

For popularity Seen Kow is not confined to Orientals resident in the Far East. In California cities this mandarin's delight finds a large and eager market, especially during the mid-winter festival before mentioned. The gentle reader will no doubt have seen it many times during his prowlings about Grant street, or any other Chinatown on the coast, without suspecting what it was that he saw. For when offered for retail sale the Seen Kow is usually of very altered appearance, and unless one be informed in the matter, not to be identified as the dried fish sound seen on the sun racks along the shore of the "Sea of Cortez."

Besides dried pancreas of fish and intestinal tissue of a variety of sorts, at least two kinds of Seen Kow are dealt in by Chinese provisioners. You can see in their shops Seen Kow the size of the palm of your hand, and costing about $10 a pound. This is an importation from China itself, and the best product of its kind on the market. The Mexican article is as large as a dinner plate, thick, and priced much lower. Both are exposed for sale in their raw state, just as they

Fig. 18. Baling the buche. A native employee of a Chinese buche buyer is preparing a shipment for transport by vessel to Guaymas. The assembled packets of sounds are first bound with wire, then enveloped with several thicknesses of burlap, and sewed tightly shut. At an average price of $2.50 or $3 each for the sounds, the value of each bale readily is seen to be considerable.

come from the dry racks, but the California good also is sold cooked, and a word must be said about that.

A dry sound, placed in a hot oven, will swell and puff itself up in a most astonishing degree. Within a very few minutes it will have converted itself into a great loaf of bubbles—a sort of sponge, resembling tried-out blubber or cracklings. Easily scorched and ruined, the sound must be toasted beneath the careful eye of an experienced baker; the feat is admittedly difficult. Because of the exact requirements in toasting sounds, many Chinese prefer to buy their Seen Kow already prepared, and this is the reason given in explanation of the fact that the Mexican buche is usually (and at New Year's, invariably) offered for sale both raw and suitably browned. The question naturally follows: Why, then, is not the small Chinese sound also sold cooked? Because, according to the noodle-house chefs, the sound from Cathay is tender and soft, and can be prepared by a simple process, without first being toasted. But the big Mexican buche is tough, and requires "puffing" to render it suitable for use.

FIG. 19. A view of fishing operations in the state of Sonora, eastern shore of the Gulf, at the new camp of *Santa Clara del Colorado*. The ax man is cutting off heads, the other removing viscera. Most of the fish in this picture are *Machorro*, or males of the Totuava species. The males are only half the size of the females, and yield no buche. Hence they are of value for the flesh only, and are considered a great bother and nuisance. Four or five men took this catch in three hours, and were disgusted that there were so few of the female Totuava.

FIG. 20. A German fisherman of *Santa Clara del Colorado*, Sonora, Mexico, dressing a choice buche taken from a big Totuava that had been killed by a tiger shark. Of all the buche makers in the business, this German is the only one who has taken pains to build for himself special furniture and tools wherewith to facilitate and expedite his work and make more comfortable the daily task of dressing large numbers of sounds.

The Hang Far Low, Pacific coast rendezvous of gourmands and epicureans having predilections toward the toothsome sauce of the soy, is declared to have served its host of transient patrons during a continuous existence of more than seventy-five years; it lays claim to the honored place of the oldest restaurant in San Francisco. At this ancient eating house, the enthusiast can banquet himself to the extreme limits of his means, and should he wish it, can there prove the qualities of Seen Kow Ching Tong (consomme of fish sounds), Guy Ngung Seen Kow (minced chicken with fish sounds), or merely Seen Kow as a side dish. The management of the institution declares that none but the small, palm-sized sound from a perchlike fish in China is used in preparing their dishes, and that this product is so different in taste and so superior in quality that they consider it not consistent with their standards of excellence to offer anything but the imported article to their clientele.

FIG. 21. German Totuava fishermen of *Santa Clara del Colorado*, holding between them a fine buche of remarkable size and whiteness. This sound, when fully dried, far surpassed the 1-kilo standard set for fancy-grade buches. The two long ducts are seen folded back over the sound, and dried in place. The buche had been exposed on a web rack over night when this picture was taken.

Accordingly, on one day's notice the Hang Far Low will serve a customer with a bowl of Seen Kow soup at a price of $3.50. A $9 or $10 pound of imported sounds will produce slightly more than three services; much special attention and care is required in preparing the unusual orders, and this devolves upon the head chef himself. Here are his two principal recipes:

1. Slice the dry imported Chinese sound; boil it until flexible and soft; drain off the water; add to soup—"chicken soup, he more better," as to sort.

2. Slice the dry imported Chinese sound; toast it in an oven until it develops a beautiful golden crust; cut into convenient sections; boil until soft; add to soup, or serve as a side dish.

The methods of preparing Mexican sounds have been described by Mr. Hock F. Lam of the Him Yick Lung Company, provision merchants of San Francisco. Mr. Lam states: "The two receipts (of cooking Seen Kow) are similar, but the taste of each preparation is a little different.

"1. Seen Kow Ching Tong (clear soup of fish bladders): Soak the sounds in cold water until they regain their soft texture. Then put them into an oven—which doesn't have to be exceedingly hot—and bake until the bladders are raised like a sponge. It doesn't take very long to get them into this stage, so take great care while baking them. Look at them every little while, so as not to scorch them. After having been baked, the bladders can be kept for any length of time. When it is desired to prepare them for food soak them in cold water until they soften. Then cut them into short strips, or into dice, and boil in some clear soup for a while. Pour this soup away, put some new soup in its place, add chicken, mushrooms, good Chinese ham, and some green onions. All these are to be added in small pieces except the onions. The onions are the last thing to be added. Boil these combined ingredients a short time, and the dish is ready to serve.

FIG. 22. On the mile-wide beach at *Santa Clara del Colorado*. The five Totuava caught by the author with a hand line weighed six hundred and eight pounds. All were females and buche yielders. The sounds were worth about $5 each; the individual dressed fish sold for about half that amount. Totuava fishing is a fish-sound business with the sale of the flesh as an incidental by-product. During the excessive heats of summer when it is impossible to truck the flesh across the deserts to market, the fishing for buche continues unabated, nevertheless.

"2. Guy Ngung Seen Kow (minced chicken with fish bladders) : Soak the bladders in hot water, then go through the same process as for the first preparation and add the same things; but at the final boiling do not use so much soup, because this is not to be served as soup—it is going to be served in gravy form. Use a little starch to thicken the mixture, and then serve."

A variation of the above procedure is proposed by Mr. Stephen Yee, merchant, of 305 Marchessault street, Los Angeles. Mr. Yee is of the firm of Yee Sing Chong Company, large dealers in comestibles.

"Ordinarily we do not stock Sing Kow," Mr. Yee has said, "it being so costly a luxury that it has little sale to our class of patronage. However, we keep a supply for our own use, and sometimes market limited quantities at New Year's.

"Mexican Sing Kow is prepared in only one manner, that being to puff it before using. The puffing is necessary because of the size, thickness and tughness of the pieces. The puffing is done in one or two ways: The sound can be baked in an oven for three to twenty minutes, or it can be cooked in very hot deep fat for five to ten minutes. If boiled in fat the Sing Kow is afterwards soaked for a half hour in running cold water, to wash out the oil. It is then boiled in water for thirty minutes, chicken broth is poured in, chopped chicken, duck or other meat and fine vegetables are added and the whole boiled fifteen minutes before serving.

"Sing Kow imported from China is not so tough as the Mexican sort. It does not require puffing. It is prepared for use by soaking over night in cold water, then it is steamed for one to two hours, and finally soup, meat, and vegetables are combined with it and the whole cooked together for an hour or an hour and a half—a longer

FIG. 23. A beach scene in Baja California. In the late summer, along many a strand on the west shore of the Gulf, sights such as this are common. Buche makers, heedless of waste, catch the great Totuava, carry them ashore, cut out the buches and leave the fish to rot. Dwellers along the coast tell that sometimes the stench becomes almost insufferable. Untold tons of valuable food are in this way wantonly destroyed each summer.

period than in the other recipe is necessary because there was no precooking or puffing."

Since the principal market for Seen Kow is China, political and economic conditions in that country intimately affect the fish sound business of the California Gulf. In proof of this, no more apt period in history could be selected than the last three years. Chinese importers and exporters of Grant avenue recount that in 1927 the Nationalist activities, and local disturbances generally throughout the nation, greatly depressed quotations on Seen Kow in China. That winter Mexican fish sounds were available in San Francisco at $1.35 or $1.40 a pound, according to the manager of the Hang Far Low. Reestablished trading conditions the following year caused an increase in price to $4.50 to $5 a pound, despite an enlargement of production amounting to several hundred per cent. Recently—in May and June of 1929, in fact—American fishing interests operating on the "Vermillion Sea" took large lots of buche to San Francisco, Oakland, Los Angeles and Fresno. The best offer made them was $1.10, and they sold for that. It is reported that the Chinese buyers at Quaymas, Mexico, bought more than eight tons of buche from one Sonora camp called *Santa Clara del Colorado* this spring, paying on the average only $1.25 a kilo, the equivalent of slightly less than $0.57, gold, per pound.

But then, the depression is general. Delicacies of a number of sorts have been affected—it is declared that the market for shark fins and for fancy edible seaweed is exceedingly low, and perhaps in even a worse state than that of the fish sound known in Mexico as buche, and elsewhere called Seen Kow.

HYDROBIOLOGICAL SURVEY OF THE HOPKINS MARINE STATION

By Tage Skogsberg

The science of oceanography, also called marine hydrobiology, is of comparatively recent origin. This late development was due largely to the inherent difficulties, both technical and financial, in making accurate observations of the phenomena taking place in the great depths that characterize most parts of the oceans. In other words, this science depended for its instruments and methods upon the developments in engineering, physics, chemistry, and biology.

However, modern oceanography, even though young, is by no means an undeveloped branch of the gigantic tree of science of today. Indeed, its growth has been quite extraordinary and the number of books and journals now devoted to this subject, as well as the present scope and variety of modern oceanographic investigations, are so great that no one person can any longer master the entire field.

The reasons for this mushroom growth were twofold. Firstly, the ocean offered a fertile and nearly virgin field for many of the old and well established sciences, such as geography, biology, etc. Secondly, a well-founded knowledge of the ocean became necessary for practical purposes. For instance, the steadily growing maritime transportation

demanded exact information concerning the prevalent oceanic currents and the drift of icebergs. Also, the sound development of the increasingly important marine fishing industries depended upon a close determination of the size of the natural stock of the various most important commercial fishes as well as of the hydrographical and biological phenomena that govern the so-called natural fluctuations in the available supply.

Although one of the earliest pioneers in oceanography, Captain M. F. Maury, was an American, nevertheless this science has been given but scant attention in America until recent years. In Europe, on the other hand, a great number of prominent scientists of many nationalities devoted themselves at a comparatively early date to this new field. Their endeavor was remarkably successful and a wealth of information, both fascinating and of practical importance, was brought forth. During the last twenty years American institutions, particularly in the East, have taken up the gauntlet; excellent work has been done, especially by the United States Bureau of Fisheries, working partly in conjunction with some of the eastern universities, by the United States Coast and Geodetic Survey, and by the Carnegies Institution. On the west coast of America the development has been slower. True, the Scripps Institution of Oceanography of the University of California, at La Jolla, has made excellent contributions, especially to physical oceanography. Also, the United States Coast and Geodetic Survey has contributed much to our knowledge of the configuration of the bottom and of the prevailing currents along this coast. Even so, the eastern Pacific still remains very little known. It should be noted in this connection, however, that extensive plans of investigation of this sea are under serious consideration at the present.

As will be understood from the previous paragraphs, most of the factors bearing on the relative success or failure of the important California fisheries are still but slightly investigated. This state of affairs should not be tolerated any longer.

For some time a hydrobiological survey of Monterey Bay and vicinity had been under advisement as a part of the program of the Hopkins Marine Station, of Stanford University, but it had not been possible to realize these plans on account of the great difficulties of such an enterprise. A new impetus to this project was given by the visit of Dr. H. B. Bigelow of Harvard University to this station during the summer of 1928. During this visit Dr. Bigelow, who is an oceanographer of extensive experience, undertook a brief but intensive survey of the hydrobiological conditions in Monterey Bay. This undertaking was made possible through the generous cooperation of the California Fish and Game Commission, the leading men of which fully realized its practical significance. The commission sent its patrol boat, the *Albacore,* from southern California, where it is regularly stationed, to Monterey Bay, and assigned Mr. E. C. Scofield to assist Dr. Bigelow in his work. It may be of interest to note in this connection that a detailed report of the results of this survey will be published shortly.

Dr. Bigelow's success encouraged the writer of this article to approach the officers of the California Fish and Game Commission with the

suggestion to continue the cooperation thus established between Stanford University and the Commission. The suggestion met with the most cordial response; and in September, 1928, a formal agreement was reached according to which the two institutions would contribute equally to a proposed program.

The California Fish and Game Commission agreed to contribute $3,000, half of which to be paid immediately, the balance a year later. Also, the commission agreed to equip their small patrol boat, the *Steelhead*, with the necessary winch and cable and to put this boat with its crew, Mr. N. Matthews and Mr. Carleton Rogers, at the disposal of the proposed survey. Finally, Mr. E. C. Scofield, whose enthusiasm for hydrobiological work had been aroused during his cooperation with Dr. Bigelow, was assigned to take charge of certain aspects of the program, particularly of the sardine investigations. Stanford University donated an equal sum of money to be paid in a similar fashion and assigned one of the staff of the Hopkins Marine Station, the writer of this article, to take charge of the work. Furthermore, Miss Lucina Stanford was employed by the institution to carry out the analyses of water samples. The fund of $6,000 thus created was to be used to purchase the necessary apparatus and to cover the general expenses of the survey.

During the last few months of 1928, the *Steelhead* was put into order for hydrobiological work, the most essential equipment was purchased, and by the end of that year the general preparations for the expeditional work were completed. On January 7, 1929, the first expedition was undertaken and from that time on regular biweekly trips have been made.

The combination of a university and a State Fish and Game Commission made it necessary, or at least highly desirable, in making out the program of the new organization, to combine purely scientific problems with those of practical and applied nature. The present program, which should be regarded as tentative and subject to revision as new needs appear, may be divided into four sections.

1. Hydrography. The ultimate aim of our hydrographical studies is to reach a scientific understanding of the movements of the water in and around Monterey Bay and to correlate these movements with the migrations of the pelagic fishes (*i. e.*, fishes that move about independently of the bottom), especially the sardine and the mackerel. As a first step in this direction the seasonal and annual changes in the hydrographical conditions in the southern region of Monterey Bay are now being investigated. Already about 200 hydrographical stations have been made in this region, and the water samples collected have been analyzed for salinity, phosphate, and silica. In addition, water samples analyzed in a similar manner are taken almost daily at a place near the Hopkins Marine Station. In the near future other chemical analyses will be added. Furthermore, the movements of the water of this region will soon be studied, partly by means of drift floats and partly by direct current measurements (carried out from an anchored boat with an Ekman current-meter). An aspect of the hydrographical work which will probably yield results of both theoretical and practical value is that of upwelling of deep water, since Mon-

terey Bay is particularly well suited for an investigation of this problem on account of the deep channel which divides the bay into two nearly equal parts.

2. Plankton. The term plankton is applied to the multitude of minute organisms, animals as well as plants, which float in the water and which are carried from place to place by currents. These organisms have of late years attracted wide attention on account of the fact that they form the most important food supply of the higher aquatic animals, especially the fishes. The plankton of the west coast of America has unfortunately been only slightly investigated and a great deal of pioneering, descriptive work will be necessary before the more important problems pertaining to this subject matter can be successfully attacked. At present several students of Stanford University are working on individual groups of plankton organisms. One aim of these monographic treatments is to map the distribution of the most common species represented in this bay in order to corroborate our conclusions in regard to the movements of the water based upon purely hydrographical data. In addition to these specialized investigations, an attempt will be made in the near future to map the quantitative changes in the horizontal and vertical distribution of the plankton in this region. A preliminary survey of this field has disclosed extreme differences in the fertility of the various regions of the bay, and there are good prospects that an attempt to correlate these differences in fertility with the local hydrographical peculiarities will yield results interesting both theoretically and from the viewpoint of the fishing industries, especially the sardine industry.

3. Fishes and Fisheries. The fishes of California, with a few exceptions, such as the sardine, the albacore, and the salmon, have been treated almost exclusively from the viewpoint of their description and classification; their habits and early life histories have been almost completely neglected. It is an important part of the program of our survey to remedy this deficiency. Several investigations are already well under way. From the viewpoint of the practical fisheries, the most significant of these is the sardine investigation since the sardine industry is by far the most important branch of the fisheries in this state. A preliminary report of the results obtained by Mr. E. C. Scofield and Mr. M. J. Lindner will be found in the next issue of the California Fish and Game. It is our hope that this investigation will bring forth a scientific understanding of some of the basic problems inherent in the sardine industry, so vital to the future of California.

The spawning and the migrations of the larval stages of the commercially most important species of flat fish will be begun next year; and the anchovy of Monterey Bay will be investigated particularly from the viewpoint of the relative significance of the eggs and early stages for the commercial fisheries. It is hoped that the latter investigation will shed light on the same phenomena in the sardine. Some fish investigations not of commercial nature are also under way, viz, investigations of the croakers and sculpins of California (their classification and habits); the breeding of one of the species of the rock cod genus; and the classification and organization of some of the deep water fishes of Monterey Bay.

In case the opportunity offers itself, we also plan to carry out fishing experiments along the little exploited portion of the California coast between Monterey and Santa Barbara in order to establish the possible presence of new and yielding fishing grounds.

4. Deep-Water Investigations. A special branch of this survey, handled exclusively by the members of the Hopkins Marine Station, will be the investigation of deep-water organisms. It should be noted that a depth of about 1000 fathoms occurs only ten miles from this station, a condition unique among the marine stations of the world. It seems certain that these investigations will bring out many results of great interest to the general public.

As will be seen from the above brief outline, the program of our hydrobiological survey is both extensive and pretentious. However, there are apparently very good prospects that we shall be able to bring our plans to a success. Our hopes are especially built on the splendid reception which our plans have had among the students of Stanford University. By next year we count on about fifteen investigators or more doing research connected with our survey.

In about fifteen years we hope to be able to compile our results into three large monographs, viz. the Hydrography of Monterey Bay; the Fishes of California, treated from the viewpoint of their classification, habits and economic importance; and the Plankton of Monterey Bay. However, before the elapse of that time, we expect that several papers of great practical significance to the fishing industries of California will be issued.

An important aspect of our work, from the viewpoint of the California Fish and Game Commission, is that we undoubtedly will direct the interest of many students toward the problems of the sea. Thus the commission in the future will have a better opportunity to select well trained men for its research staff.

As a concluding remark it may be of interest to mention that a cooperation similar to that outlined above has recently been established between the United States Bureau of Fisheries and the Bingham Oceanographic Laboratory of Yale University. The program of this cooperation is less extensive than ours but the underlying principles are the same.

HALIBUT—SOME FACTS ABOUT THE KING OF THE BANKS*

By John P. Babcock, Chairman, Pacific Halibut Commission

The halibut is the largest of the edible flat fish, one of the most important of food fishes. It is indigenous to both the North Atlantic and North Pacific. It is seldom found south of the fortieth parallel. It is not found south of the equator. It exists in the greatest abundance off the British Columbia coast. Early explorers to the Northwest coast of the Pacific noted its abundance. Captain Cook recorded in June, 1778: "Our people caught 300 halibut this morning." He was at that time in the vicinity of Kodiak Island, Gulf of Alaska.

The halibut spend their entire life in salt water. They spawn in deep water fifty to 250 fathoms in depth, in the fall and winter. Their

* Reprinted from *Canadian Fisherman*, Vol. 16, No. 8 (August, 1929) pp. 13–14.

eggs are fertilized after they have been expressed by the females. They float at varying depth, usually below eighty-five fathoms. Those collected by the commission's staff were taken from eighty-five to 750 fathoms in depth. The eggs when ripe are translucent, free of visible globules or floating particles. The outside capsule is marked with delicate short intersecting lines. They are round and 3.86 millimeters in size. The time taken in incubation is unknown. The only larvae stages collected by the commission were taken in the Gulf of Alaska at depths from 250 to 850 fathoms. They were in the yolk sac stage, all under 12.4 millimeters in length. They have long snake-like laterally compressed bodies. The eyes, proportionately spaced on opposite sides of the head, are large and the snout pugged. The pectoral fins are small and larvaeal, the dorsal and pectoral fins not yet shown. In the Gulf of Alaska the eggs and larvae drift to the westward. The commission has collected a large number of the very early larvae stages that are much smaller than those previously collected anywhere. But so far the older stages of the very young, fully formed fish have been taken only in Europe.

After the yolk sac is absorbed they swim upright like most fish. Both sides of the head and body are alike. How long they swim upright; and when and what changes occur before they acquire the habit of lying on one side, with the head twisted sidewise, both eyes on the upper side, is unknown. It is one of the most fascinating problems on which the commission is engaged. It is one of the most engaging problems in marine biology.

In recent years there has been no branch of fishery science as rich in results as that of the study of age and rate of growth. Not only does it show the rate of growth at which species develop and the time taken in the immature and mature stages, but it throws light upon their movements—thus in the salmon, the length of time spent in fresh water, the time in the sea, and the river in which it is hatched. The same method has been used in herring, a classic instance being the discovery that in a certain locality on the Norwegian coast the growth in a particular year was very small. The herring originating there were marked by this small growth—so that their migrations were followed year after year.

The halibut has an inner ear but no external ear. In the ear a stone is developed, which grows in size from year to year by deposits from the outside. The winter growth is more transparent than the summer growth, making a stone which is marked like the rings of a tree. The bones are called otoliths, or earbones. They are used to determine age. The scales of the halibut also show growth rings, but they are so constructed as to make it more tedious to determine, than the study of the ear-bones.

Halibut mature in their eleventh year, though a small percentage has been recorded at eight. Halibut of forty years of age have been recorded. The growth of the halibut is slow, and they grow faster on southern banks than on the more northerly. On the Masset banks fish nine years old have a length of seventy centimetres, while the seventy centimetre length fish on Shumagin banks are in their eleventh year.

There is also a great difference in the weight attained by the females and the males. Females weighing upwards of 400 pounds have been taken. From 100 pounds upwards the fishermen term the females "whales." The largest females produce as many as 5,000,000 eggs. The mature males are much smaller than the females. They do not attain a weight much over eighty pounds even at thirty years of age.

The study of racial characteristics has been most productive. The fish taken from some banks can be distinctly recognized as characteristics of that section. There is a difference in head, length, body, width. In the Gulf of Alaska the fish on the Yakutat banks show an affinity with those on the Shumagin; and those on the Timbered Island banks, in southeastern Alaska, with those on the Masset banks in British Columbia. It is evident that each bank has its own average rate of growth. When it is remembered that this rate of growth is the net result of between eight and eleven years of life, during which extensive wanderings might have been undertaken by each fish, the difference proves that the individual fish must have remained more or less under the particular types of environment to produce such differences. The difference in the rates of growth on various banks is confirmed by other racial study and by tagging. They, too, show that the population of the banks differ markedly—consist of races of halibut can be distinguished one from the other.

The racial study of halibut has been greatly aided by tagging. Tagging was first undertaken in Hecate Strait in 1925. The fish tagged were caught by vessels chartered by the commission. They were caught in regular gear and taken in lines over the side of the vessel as usual. They were carefully removed from the hook and examined to see that they had not been fatally injured, then laid in troughs with metal seals along the center from which lengths were secured. Scales were taken and records made of exact location. By means of special plyers, a short metal strap tag, with an eye in one end and point on the other, was securely fastened to the upper side of the cheek and the fish put back into the sea, free to do as it pleased. Each tag bears a number, the letters I. F. C. and the year. Up to summer of 1928 some 8338 fish were tagged and liberated. As each tagged and liberated fish was worth from $1.50 to $2.50, their value was considerable. A reward of $1 is paid fishermen for the return of the tags and the date of the capture and location. Two dollars is paid for opportunity for examination of the fish, with tag attached, for growth records.

Up to November, 1927, 1000 tags had been returned. In 1926 over forty-three per cent of the fish tagged at Cape Chacon in 1925 were recovered. The main object in tagging was to determine the question of migration. The returns to December 27 show that, south of Cape Spencer, ninety-eight per cent traveled less than 100 miles; ninety-five per cent less than fifty miles; eighty-five per cent less than twenty miles, and seventy-five per cent less than ten miles. That indicates that the great majority of the fish remained on its own bank.

Tagging experiments in the Gulf of Alaska were not undertaken until the winter of 1926–27, eighty-eight per cent of the fish tagged being mature. The returns have not been fully tabulated, but the rate of

travel shown is very much greater than that shown on the southern banks. The average travel of seventy fish was 304 miles; seven fish traveled over 600 miles, and one close to 900 miles. Only three of the fish recovered were taken south of Icy Straits, indicating that the Yakutat fish do not mingle with southern fish. This last winter the commission has tagged additional fish in Alaska, the recovery of which when tabulated should be illuminating as to northern migration.

A DIALOGUE ON FISH AND GAME PROTECTION

By Captain W. B. Sellmer and Mrs. W. B. Sellmer

A radio address given over KRE by a game warden and his wife who is the only woman warden in the state

Mrs. Sellmer: Well, Walter, we have just been introduced to the audience in very glowing terms, and I suppose we are expected to be formal, and all that sort of thing in our conversation before the "mike." So how are we to address one another in this little discussion?

Mr. Sellmer: Madam, we'll start right now with an understanding. We are not at home now, and I insist, upon being treated with respect. So, in your remarks to me this evening, I am to be addressed as Captain Sellmer, or Mr. Sellmer. At home, of course, w-e-l-l, that's different; sometimes there's a little argument about who's who, but in the field and on duty, I'm your superior. However, like "Who killed Cock Robin?" that question never will be settled.

But, seriously, Mrs. Deputy Sellmer, to start with, I want to read a little letter I received the other day from a lover of animals and life in the open places. In it this man paraphrases an incident from a narrative written just before his death by James Oliver Curwood, in early life an inveterate and wanton destroyer of game. A man of wealth and leisure time, he spent both in the pursuit and destruction of wild game in all corners of the earth. His regeneration, to quote my correspondent, came about in this wise:

Encamped on the banks of a stream in British Columbia one season, Curwood took his gun and strolled along the water's edge. About to cross, he glanced up and through the bushes he saw a mother bear lapping in the ripples. The bear observed him at the same time and rose to her hind legs. He fired, the charge of buckshot tearing a great hole in the chest of the animal. With a moan the stricken animal dropped to all fours and shambled totteringly into the bushes. Curwood stood for a moment, listening to the sad little cries that came from the hidden retreat of the bear, and then he crossed to where he could see the animal he had mortally wounded.

What he saw, forever cured him of taking innocent life. There sat the mother bear, clasping to her torn body two little cubs, one under each forearm. She was swaying from side to side and lapping the baby faces of the cubs with her rough tongue. Stricken with remorse, the hunter, still with his smoking gun, watched the tragedy he had wrought until the grim end came. The sobs of the wounded mother were almost human. The hunter approached. The mother raised her brown eyes reproachfully to his face, pressed the little cubs in one last

embrace to her bleeding body, her muscles relaxed and the little cubs, wondering, dropped to the ground and sat by the stiffening form of what had been their mother.

The hunter adopted those little cubs, and from that day to the end of his life, he devoted his great talents to atonement for what he had done. He wrote and lectured against the wanton destruction of innocent animals.

Well, that's all of that, but there is a lot to think about in it. And now, to take up our own work: Did you ever realize what a great game in life we are playing? It reminds me so much of the game we used to play when we were little—the game of hide and seek. Remember? The only difference in our game of today is that we are always "IT."

MRS. SELLMER: Yes, I have often thought of that, but being "It" in our game of today is a pleasure, because we love what we are doing. We feel that we are doing a great good by trying to save wild life so that the sportsmen of the future will benefit by our efforts.

MR. SELLMER: That is true, and I am glad to say that every man on our patrol feels the same way and is working toward that end.

MRS. SELLMER: Now, C-a-p-t-a-i-n Sell-mer, what do you think of the present force of wardens compared with the wardens of 30 or 35 years ago?

MR. SELLMER: Well, that's a long time ago, and it takes me back to my rattle days, but from information that I can gather, I understand that there were but few wardens at that time, and that they operated with little or no system. Some of the old-timers have told me that those were the days when gun play and abusive language ruled, and that no consideration was given to educational principles. Today the warden is of an improved and different type. Today there is *system* used in every branch of our division. The chief of patrol and each patrol captain has a system of his own under which our wardens operate. We try to prevent the destruction of our wild life by education of the public. The warden goes deeper into the violations, seeking solutions and endeavoring to secure conclusive evidence in order to apprehend and convict the most cunning of violators. He is always a gentleman in his treatment of hunters, ever ready to impart information to those who desire it, and wants to be considered the friend of all fair sportsmen. He would rather prevent a violation. The system is changed since the old days. But, Deputy Sellmer, on your own patrolling through the hills, do you ever feel nervous in the discharge of your duties?

MRS. SELLMER: It has never occurred to me to feel nervous. I love the work and am always thinking of what we are trying to achieve Perhaps that is the reason.

MR. SELLMER: Do you ever go deer hunting yourself?

MRS. SELLMER: No, I never have.

MR. SELLMER: Then you don't like to shoot and kill deer?

MRS. SELLMER: No, I do not, but I have killed many deer that have fallen mortally wounded, some by hunters' bullets, some run down by autos, and others from a number of other causes. In those cases, shooting them is an act of mercy.

MR. SELLMER: I suppose you find it easier to arrest a woman than a man.

MRS. SELLMER: On the contrary, I would rather arrest a man any time, because they generally know what it is all about, while a woman appears to be indifferent.

MR. SELLMER: Well, we agree perfectly, but I didn't want to say I felt the same way until I knew how you felt about it.

MRS. SELLMER: By the way, Captain Sellmer, tell me about the last spotlight case you and your deputy, Mr. Ahart, made the other day. I want to hear you explain the method you used to apprehend the violators.

MR. SELLMER: Very well. No doubt you recall receiving a message from member 379, who gave you code numbers 24-14-40-51 and 55. This code, deciphered, read: "Hunting deer tonight, spotlight. See me for particulars." Deputy Ahart and I started at once, interviewed No. 379, and then arranged a combination of red and white lights for use in stopping automobiles. These were placed and made ready for instant use. We stationed ourselves on the highest point overlooking Olema Valley. Midnight, no light; 1 o'clock, still no light, and then, at 1.30 the hillsides of Olema Valley were sprayed with the flare of a powerful 50-candle spotlight, searching for deer. The light crept closer, and we were ready. The trap was set. The violators approached. The red lights were turned on at the right moment. The approaching car stopped, and lights of another machine, placed there for that purpose, were turned on, blinding the eyes of the driver. At the same time lights from the rear closed in on the trapped machine. In the trapped car were three men, each with a loaded rifle. We failed to find a spotlight in the machine. The men denied having one. A search over their route, and but a few feet back, disclosed a spotlight lying in the ditch. The men disclaimed it until we discovered the connecting link, represented by a short piece of wire which served as a connection between the light and the battery on the machine. The evidence was complete and the men pleaded guilty to charges of hunting deer by spotlight at night.

MRS. SELLMER: That was very interesting. And to think, the little piece of wire secured the conviction of these men.

MR. SELLMER: Yes, it often occurs that the smallest bit of evidence leads us to the apprehension and conviction of some noted violator. We must not overlook one thing. By the way, Deputy Sellmer, will you tell me about the fish case you had at Martinez. I meant to ask you before of the details of that, but forgot it.

MRS. SELLMER: Well, as you know, you sent me to Martinez to investigate and run down a report that undersized striped bass were being sold by a certain fish dealer. I found that this dealer was selling contraband fish to those whom he thought he could trust. This dealer was very clever and used every precaution. I recognized a difficult task. In preparation, I surveyed the surrounding country to find a location which I could give as my address. I found a new tract of land which contained a half dozen houses, just completed. I selected one of these houses as my address, noting the number, street and name

of the tract. This information was to be given in case I was asked where I lived. My husband, I had decided, was a steel worker employed at Richmond. Then dressed in a plain house dress I started out to buy the undersized bass. Naturally, I was not successful at first, and I did not insist very strongly. I bought fish, of legal size, every two or three days, and each time Mr. Fish Dealer was gaining confidence in me, but the usual line of questioning was propounded at each visit. On the fourth or fifth visit I was successful in buying undersized striped bass, but I continued to patronize Mr. Fish Dealer for a month, and then one day surprised him by placing him under arrest for the part he was playing in the destruction of immature striped bass.

MR. SELLMER: Accept my congratulations and compliments. Such procedure as that is necessary to round up the conscious and deliberate violator. I know, of course, that the man was deservedly and severely punished, and I know that your work resulted in putting a stop to his nefarious and unlawful practice, which is frowned upon by every honest seafood dealer along the coast.

You asked a while ago about the difference between the present and the old days. There is a great difference—due mostly to education of both the game wardens and the public. In the old days there were many more violations, due, perhaps, to a laxity, or maybe, lack of law. The violators, too, were easier to apprehend. Today there are fewer violations and fewer violators, but they are the clever, plotting hunters, who intend deliberately to violate the law and circumvent the game warden. Today we get more cooperation from the public. It is a recognized fact that we are working for the public good. The square sportsman knowns that the game warden is his friend. He is required to be courteous and considerate and to use good judgment. His business is to prevent violations—not primarily to make arrests. The violator, too, is finding it more difficult to ply his unlawful trade, when, any hunter or fisherman he meets may chance to be a "square sportsman" and report violations, with which he has no sympathy.

And now in conclusion we hope that our radio audience has enjoyed our little talk as much as we have.

MRS. SELLMER: Yes, and now C-A-P-T-A-I-N Sell-mer, when we get home, we will finish this little argument about who is MY superior.

CALIFORNIA FISH AND GAME

A publication devoted to the conservation of wild life and published quarterly by the California Division of Fish and Game.

Sent free to citizens of the State of California. Offered in exchange for ornithological, mammalogical and similar periodicals.

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All material for publication should be sent to H. C. Bryant, 510 Russ Building, San Francisco, California.

January 30, 1930

"An empty water is an idle resource. On the other hand, waters well stocked with fish are valuable not only for the food and recreation furnished by the fish themselves, but by attracting people to the country, such waters add materially to the value of other forest resources and to the value of private property."

FIRST GAME REFUGE PURCHASED

On the eve of the opening of the duck season, California duck hunters received the welcome news that the division had purchased the first refuge of the chain to be established as the result of the determinations of the Govenor's Advisory Committee on Game Refuges. The new refuge is located in Merced County, three and one-half miles northeast of Los Banos. It is in the old Buttonwillow Lake area which was celebrated in the early days as a place abounding in waterfowl. The sanctuary covers 3000 acres and represents an investment of $105,000. The purchase includes water rights and adequate provision has been made for as much water as will be needed.

The refuge represents the first *purchase* by the State of California of an area to give protection to waterfowl. In 1869, the California legislature prohibited hunting and fishing in and about the shores of Lake Merritt, in the heart of the city of Oakland. Time has transmuted this area into a notable duck refuge. Richardson's Bay, a part of the Mount Tamalpais Refuge, represented the first area set aside by the legislature with the intent that it should serve as a sanctuary for ducks.

The Game Refuge Advisory Committee has made a tentative location of another refuge in southern California. The committee is considering a number of others in the Sacramento and San Joaquin valleys. These considerations are based on an exhaustive survey of the state.

The Los Banos refuge will be developed as rapidly as possible. On January 1, over 600 acres had been flooded. This will be added to as rapidly as conditions permit until 40 to 50 per cent of the refuge is under water.

Equipment has been purchased. The area has been posted and will be fenced. An exhaustive study of native duck foods is under way and plans are being made for additional feeding. It is the intention of the division to make this, as well as all other refuges, ideal from the waterfowl point of view.

William H. Armstrong.

IN MEMORIAM

WILLIAM HERRING ARMSTRONG

The passing of William Herring Armstrong on November 21, brought to an end the career of a big hearted, faithful and fearless officer. Deputy "Bill" Armstrong's death followed a brief illness and terminated while he was lying down reading a newspaper. It was 6 p.m. and "Big Bill," as he was affectionately known, was taking his ease. It seemed as though his activities were cut short while he was in the very midst of serving the state and protecting its fish and game.

"Big Bill" was born in New Jersey on August 17, 1868. He was appointed a special deputy of the Fish and Game Commission on June 7, 1897. Ten years later he was attached to the regular patrol. Though handicapped by the loss of his right hand, "Big Bill" performed his duties as efficiently as any other man on the force. The death of this veteran fish and game protector is a personal loss to thousands of sportsmen with whom he dealt in the course of conservation duty.

He protected our fish and game in the best of faith, because he had the sportsman's abiding love of it; a love that has accomplished all practical results in its behalf that this state ever has attained.

It was 32 years ago that "Big Bill" first took up his duties. It was during those days when conservation enforcement lacked support, and when great danger lurked in every nook and corner. Those days are gone and are now numbered in the "Dark Ages" of California.

"Big Bill's" death is a loss that can not even be written of by those who knew him without tears. Particularly does it come home to those of us who can not bring ourselves to believe that this big fellow, who gave his life to his duty, and for a great cause has left us forever.—WALTER B. SELLMER.

THE AMERICAN GAME CONFERENCE

The Sixteenth American Game Conference held in New York City December 2 and 3 was attended by practically all game officials or their representatives and by conservationists representing every section of the nation. Held under the auspices of the American Game Protective Association, the conference has come to be recognized as one of the great clearing houses for the nation-wide problems confronting the protectors of wild life.

One of the outstanding reports to be heard was that of the committee appointed to formulate a national wild life policy. The importance of placing the wild life resources of the country on a permanent and continuing basis is everywhere recognized. Hence, the policy which the committee formulated is expected to have a weighty part in the guidance of game management and in administrative plans for the future.

Dr. H. C. Bryant, chief of the Bureau of Education and Research of the Division, represented the California Commission and represented President I. Zellerbach on the Committee on American Wild Life Policy. Dr. Bryant delivered an address on California's Educational Program and displayed three reels of motion pictures exhibiting the work of the division. Details of the proceedings of the conference will appear in these columns in the near future.

WILD LIFE COMMITTEE ENLARGED

Chairman I. T. Quinn of the Sixteenth American Game Conference held in New York December 2 and 3 under the auspices of the American Game Protective Association appointed three additional members to the committee provided for at the last conference to formulate an American wild life conservation policy of which Aldo Leopold, Madison, Wisconsin, is chairman.

The committee is made up of representatives from every part of the country, including in its number scientists, game officials and sportsmen.

The three new members appointed are:

I. Zellerbach, Chairman of the California Fish and Game Commission, San Francisco.

Sam Rathbun, Supervisor of Game and Fish, Seattle, Washington.

Dr. Fred Pettit, Albuquerque, New Mexico.

The other members of this committee are:

Paul G. Redington, Chief, Bureau of Biological Survey, Washington, D. C.

John B. Burnham, Essex, New York.

J. B. Harkin, Department of the Interior, Ottawa, Ontario, Canada.

Seth E. Gordon, Conservation Director, Izaak Walton League of America, 541 W. Randolph street, Chicago, Illinois.

Dr. John C. Phillips, president American Wild Fowlers, 41 Mount Vernon street, Boston, Massachusetts.

Geo. A. Lawyer, New York, Development Association, Watertown, New York.

Major A. Willis Robertson, Chairman, Commission of Game and Inland Fisheries, Lexington, Virginia.

Dr. Geo. Bird Grinnell, New York, New York.

J. B. Royall, Tallahassee, Florida.

Ray O. Weems, Oklahoma City, Oklahoma.

Carlos Avery, President, American Game Protective Association, New York, New York.

JOINT CONVENTION CONSIDERS PROBLEMS OF INTERNATIONAL INTEREST

The joint annual convention of the American Fisheries Society and the International Association of Game, Fish and Conservation Commissioners was held in Minneapolis, Minnesota, September 9 to 13. The convention represented the fifty-ninth annual meeting of the American Fisheries Society and the twenty-third annual assembly of the International Association. A large number of officials and scientists from all parts of the United States and Canada attended.

The discussions embraced almost the entire field of fish culture, game bird production, fish and game protection and game administration. Emphasis was placed on the soundness of the latest developments in conservation. Accord-

ingly, the sessions were a clearing house for information and ideas. They really were "a short, high pressure training school for recruits to the field" says Seth E. Gordon, and "a postgraduate course for the old hands in the game."

Of especial interest and importance were reports on diseases of fishes, special nutritional studies of fish, development of refuges for wild fowl, breeding range of various species of waterfowl, problems involved in the production of more game and methods of controlling an overabundance of game.

Resolutions were adopted by the Fisheries Society urging immediate steps toward the control of the international fisheries, especially those of the Great Lakes. The association adopted a resolution commending the work of the National Committee on Wild Life Legislation and urging that the committee continue its good efforts in behalf of improved federal legislation.

John L. Farley, executive officer of the division, represented the California Commission. While en route to the convention, Mr. Farley made stops to confer with the fish and game departments of Oregon, Utah, Montana, Colorado and Wisconsin. Much comparative information was secured and this, together with that gleaned from the conference, will be of considerable value and aid in enabling him to handle the program adopted by California.

SURVEY OF GAME REFUGES IN OTHER STATES

When the hunting license fee was raised by the 1927 California Legislature to $2 it was written in the law that one-third of the moneys received from such sale should be expended for the development of game refuges and public shooting grounds. With the extensive development of refuges in mind, J. S. Hunter recently investigated the methods employed in various states. It is expected that his findings will help to solve the problems in California.

Mr. Hunter's first stop was at the Bear River Marsh Migratory Bird Refuge in Utah. The Utah public shooting grounds north of Salt Lake City were also visited. Attendance at the convention of the International Association of Fish, Game and Conservation Commissioners at Minneapolis permitted conferences with representatives of various states and provinces. From these conferences many new ideas were gleaned on refuges, public shooting grounds, control of clubs, purchase of lands, control of predatory animals and the like.

While in Illinois, Mr. Hunter investigated the park refuge system plan. At Lansing, Michigan, he studied a plan for control of predatory animals and game refuges, and the laws relating to fur bearers and the control of shooting areas. Many sections in Louisiana were visited.

CONVENTION OF ASSOCIATED SPORTSMEN

The Fifth Annual State Convention of the Associated Sportsmen of California was held at the Hotel Whitcomb, San Francisco, October 25 and 26. The convention has been judged as the most successful, most constructive and best attended ever held. Delegates from 44 member clubs participated.

Speakers included many federal and state officials and legislators. Senator Sanborn Young, chairman of the Senate Fish and Game Committee session of 1929, detailed some of his experiences in fish and game work, and strongly urged that the California Fish and Game Commission be given full regulatory powers to govern fish and game. The chairman of the Assembly Committee, Hubert B. Scudder, spoke on the construction of a permanent jetty at the mouth of the Russian River, Assemblyman William P. Jost also spoke. United States game protector George Tonkin told of the work of the federal government and of the Tule Lake Bird Refuge. L. A. Barrett, assistant district forester, outlined the policies of the Forest Service in defense of an argument by James Davis, advocating light burning. Executive Officer John L. Farley, Attorney Eugene D. Bennett, Chief of Patrol E. L. Macaulay, Captain Walter Welch and Superintendent of Game Farms August Bade spoke on various phases of the division's program for protection and restoration of game.

The entire matter of improving the association's finances and membership was discussed at considerable length and a new policy decided upon. Every effort will be made to secure the active support of member clubs financially as well as morally. At present the organization represents a parallel to the American colonies before the adoption of the constitution. To make for greater unity, member clubs will be urged to affiliate with the central organization as chapters.

Among the important resolutions was one favoring the granting of plenary powers which read as follows:

WHEREAS, The supply of fish and game is on the decrease and in some cases has reached the vanishing point, everywhere except in those states and jurisdictions which have adopted the plan of an appointed commission with full regulatory powers, and full territorial jurisdiction, and

WHEREAS, In states and jurisdictions where commissions with full regulatory powers and full territorial jurisdiction have been instituted, the tide has turned and the supply of fish and game commenced to be restored; and

WHEREAS, The system of entrusting to the legislatures of the several states, jurisdiction to legislate for fish and game has been proved ineffective and unsatisfactory and offers no hope of improvement in the future; and

WHEREAS, It has been demonstrated by the experience of California and other states, that the cause of the conservation of game and fish, whether game fish or commercial fish, is best advanced by entrusting the same to a commission appointed by and removable at the pleasure of the governor of the state, clothed with state-wide jurisdiction and with full regulatory powers with reference to seasons, bag limits and all other powers over fish and game heretofore exercised by the legislatures of the several states; therefore be it

Resolved, That this Fifth Annual Convention of the Associated Sportsmen of California in meeting assembled at San Francisco, October 25 and 26, 1929, does hereby approve the appointment of a Fish and Game Commission by the governor of our state, with full territorial jurisdiction and full regulatory powers, the same to hold office at the pleasure of the appointing power, and strongly recommend to the sportsmen and sportsmen's clubs affiliated with us that they use their best efforts to further the foregoing by the adoption of appropriate legislation, whether by legislative or initiative act, constitutional amendment or otherwise as may seem proper."

This resolution precipitated considerable discussion by the delegates. On roll call a vote of twenty-five clubs in favor of adoption was recorded as against two clubs opposed and two not voting on the resolution.

Albert Lindley of Stockton proved a most resourceful and entertaining toastmaster at the banquet which brought the convention to a close. Fred G. Stevenot, Director of the Department of Natural Resources, and I. Zellerbach, president of the California Fish and Game Commission, delivered the principal addresses.

SPORTSMEN ADVOCATE FULL REGULATORY POWERS

The Stanislaus-Tuolumne Fish and Game Protective Association is among the oldest of the present day clubs of sportsmen. From the standpoint of unbroken and continued existence, it probably holds an unique record. At its annual meeting, held in Modesto, Stanislaus County, November 17, unqualified endorsement was given to the resolution adopted at the Associated Sportsmen's recent convention advocating "the plan of granting to the Fish and Game Commission full power to regulate seasons, bag limits, define fish and game districts, and make such other necessary rules and regulations to restore and perpetuate the supply of fish and game in California."

President F. W. Leighton in summing up the measure enumerated that the new system would confer the following benefits:

1. Speed up action on changes in fish and game regulations, thereby guaranteeing more effective and certain administration.

2. Decision on regulations placed with experts who by knowledge and experience are best qualified. Responsibility for results fixed on these officials.

3. Ability to regulate in times of emergency and to control the numbers and welfare of fish and game during epidemics or unforeseen changes in conditions affecting fish and game resources.

4. Supplies necessary authority to permit the Fish and Game Commission to make good on the responsibilities with which they are charged, thereby developing that pride and satisfaction which goes with success.

DEER KILL FOR 1929

A compilation of deer tags shows that 21,220 deer were killed by hunters during the 1929 open season in California. This is 295 less than the count for 1928.

Mendocino County leads this year with a total of 1355 deer killed. Last year in this county the count was 1468. Siskiyou County, which topped the 1928 list with 1654, was second in the 1929 count with a total of 1211. Lake County held its own in third place with 841, but this was less than the 1928 total of 1038. In Los Angeles County the hunters had better luck than in 1928, as the tags from that large county show 691 this year as against 369 for last season. Sutter County, with two deer killed, had the smallest number, while in San Francisco and Sacramento County, the records show no deer were taken. Last year two fell before the guns of the nimrods in Sacramento County.

IMPORTANCE OF DEER TAGS TO SCIENCE

A small per cent of successful deer hunters this season failed to send in their duplicate deer tags. Procrastination is a common fault. But does the cause lie wholly in this tendency? Despite the wide publicity given to the value of the deer tag system, many hunters remain in ignorance of its importance as a factor of scientific game management.

When fully tabulated, the tags will give accurate knowledge of the abundance or lack of abundance of deer in all parts

of the state. If the numbers of deer killed over a period of time in a given locality are progressively fewer and fewer, this may indicate that the animals are on the decrease and need special legislation. On the other hand, if the kill indicates an increased population, it may be necessary to be more liberal with regulations to prevent over-stocking and its usual accompaniment of diseased conditions.

So long as the proper safeguards are imposed, an adequate breeding supply can be perpetually conserved. Since the number of tags turned in has a direct bearing on knowledge of conditions, the more complete the statistics, the more certain and adequate will be the protection given.

FIG. 24. Unloading bass at Calipatria, Imperial County, California, for stocking Salton Sea. Photo courtesy of Robert Hays, October, 1929.

FIG. 25. Conveying striped bass to planting grounds, Salton Sea. The boat is equipped with airplane motor, propeller and aerial rudder so as to speed over the shallow flats. Photo courtesy of Robert Hays, October, 1929.

GAME LAW ABSTRACTS

Game law abstracts for the year 1929–1931 are now available. The outstanding information relating to licenses, districts, seasons, bag limits, protected species and other regulations is presented in concise form. The abstract has been distributed to those handling licenses for the division or may be obtained from law enforcement officials. Sportsmen and anglers are urged to secure copies in the interest of knowing the law.

An abstract poster has also been issued for display in sporting goods stores and public places. The limited edition prevents extensive distribution to individuals.

STRIPED BASS INTRODUCED IN SALTON SEA

In October, two plantings of striped bass were made in the Salton Sea. The second plant appears to have been made with perfect success. The fish arrived from Tracy, California, after twenty-four hours on the road and one hour later were investigating their new home. A flat-bottomed boat equipped with an airplane motor, airplane propeller and aerial rudder and made to skim over the shallow water with considerable speed, materially aided in getting the bass to the planting grounds with all dispatch.

To guard against the predatory sea birds which haunt the great inland sea, the fish were planted in fairly deep water.

The plants came as the result of an investigation made by Biologist George A. Coleman. Striped bass have never before been introduced into a landlocked sea, but conditions are such that the experiment was believed to be practicable. Those who have experienced the thrill of catching the fish claim it is a bold biter and altogether a wonderful game fish. Robert Hayes, secretary of the El Centro Chamber of Commerce states that lovers of fishing are awaiting with eager anticipation the time when the bass will be of sufficient size and numbers to permit angling.

THE MONTANA GRAYLING IN CALIFORNIA

Izaak Walton called the grayling "the flower of fishes." It is just that. The only place in the Union where the grayling is propagated is at Anaconda, Montana, where about fifteen million eggs are taken each year. There fish spawn in May and June. The eggs are placed in hatching jars, such as are used for hatching white fish eggs. They have, however, been hatched with good success in wire baskets of small mesh.

Dr. Treece, superintendent of hatcheries for Montana, writes: "Another difficulty about the propagation of the grayling is the fact that we have never found any form of food for the little fellows, and as a result he must be taken out and planted before the little food sac is absorbed." It was to remedy this condition that research, regarding food for young grayling was inaugurated at Steinhart Aquarium, in Golden Gate Park, San Francisco.

On May 19, 1924, we received at the Steinhart Aquarium about 4000 grayling eggs in eyed condition. They were placed in the hatchery, and by May 30 they were all hatched. As soon as the food sac was absorbed, we began feeding them, trying each of the following: Boiled egg squeezed through a cloth, powdered shrimp, meat juice, sour milk curd, fresh fish ground to powder, liver and beef heart. None of these could be regarded as a success and the death rate mounted rapidly. Within four months, every one of these young grayling were lost.

On June 24, 1929, the Montana Department of Fish and Game sent the aquarium about 30,000 grayling eggs, all of which hatched in fine condition. We at once got in touch with W. H. Shebley and offered to the Division of Fish and Game, about 25,000 of these young grayling for planting in such places in California as he might choose. We suggested that Mirror Lake in the Yosemite Valley as closely approximated the conditions of Georgetown Lake, in Montana, where the eggs were secured. The young grayling were accordingly taken to Mirror Lake by the representatives of the division's fish cultural bureau and planted on July 3, 1929. About one week later a second lot, of perhaps 5000 young were sent to the Mt. Shasta Hatchery for planting in northern California. The remaining fish were retained at the Steinhart Aquarium for experiments in feeding with live food, large quantities of Daphna, Infusoria, and small brine shrimp being used for this purpose, but without success.

The problem of feeding young grayling is still one awaiting solution.—ALVIN SEALE, Superintendent of the Steinhart Aquarium.

SALMON BULLETIN PUBLISHED

Fish Bulletin No. 17, "Sacramento-San Joaquin Salmon (*Oncorhynchus tschawytscha*) Fishery of California," by G. H. Clark, is now off the press and available for distribution. It is expected that this publication will be read by many because of the great interest shown in the salmon of California. This report deals with the

early history, fishing methods, hatchery output of salmon eggs, evidences and causes of over-fishing in the Sacramento-San Joaquin salmon fishery and possible remedies to overcome depletion. The second part is a survey of spawning grounds of salmon throughout the Sacramento-San Joaquin river systems, giving locations of dams that are barriers to the fish, and details of each stream in these two localities. The third section of the bulletin is more technical but will be of interest since it deals with the age determination of salmon by means of scales. There are several tables in this publication which contain valuable data on the output for distribution of salmon eggs and young fish from the three U. S. Bureau of Fisheries hatcheries, as well as statistics on the pack of canned salmon of the Sacramento region from 1864 to 1919, and early catch records of salmon for the period 1874–1927.

Anyone interested in this publication may obtain a copy by writing to the California State Fisheries Laboratory, Terminal Island, California.

EUROPEAN CANNERIES STUDIED

Dr. Karl F. Meyer, director of the Hooper Foundation for Medical Research in San Francisco, and consulting pathologist of the division, visited Italy at the request of an emissary of the Italian government, to make a study of the canning industry in that country and to complete a report for Benito Mussolini. On his way to Italy Dr. Meyer visited Switzerland and studied the canning industry there as part of a survey of this phase of industry in the leading countries of Europe. He returned to California in November.

AMERICAN LEGION AND CONSERVATION

At the state convention of the American Legion recently held at Anderson, South Carolina, conservation was endorsed as one of the means "working for the betterment of the country, the state, and the local community, and for the upbuilding of the youth of the nation." The following resolution memorializes this splendid attitude:

WHEREAS, The American Legion has always fostered and encouraged the upbuilding of our nation and our state and for the conservation and development of influences and resources that are for the benefit of our people, and

WHEREAS, We feel and believe that, due to advancing civilization and modern industrial development, that great inroads are being made in the forests and streams and wild life of our state, and that this is a valuable resource that we can ill afford to have depleted and perhaps wiped out entirely; and

WHEREAS, We believe that the loss of this outdoor life, with its health-building recreation of hunting, fishing, camping and hiking would tend to deprive the youth of the nation and the state of a valuable form of outdoor sport that is a builder of character, self-reliance, initiative and manliness, all valuable attributes in the manhood of the nation and state in times of peace, as well as in a time of national emergency; therefore, be it

Resolved, That the Department of South Carolina of the American Legion, in convention assembled in Anderson, S. C., June 24 and 25, 1929, endorsed and recommends a program of reforestation, conservation and restoration of wild life in South Carolina and commends to each individual post in this department that they interest themselves in some phase of this work for the benefit of their own community and the state at large, sponsoring post activities in conservation and restoration and cooperation with all worthy agencies now striving for the same end.

SPORTSMEN DEFEND KLAMATH RIVER

The Associated Sportsmen of California have taken definite stand against the building of dams in the Klamath River as evidenced by the following resolution:

WHEREAS, The Klamath River is the principal source of supply of salmon and steelhead trout spawn for artificial propagation of those species of food fishes in the State of California; and

WHEREAS, The people of the State of California, by Initiative Act passed at the general election in November, 1924, ordained that the waters of the Klamath River were, and would thereafter be the Klamath River Fish and Game District and prohibited the construction or maintenance of any dam or other artificial obstruction within the district; now therefore, be it

Resolved, That this Association unalterably reaffirms its adherence to the principle that the Klamath River should be kept free of dams or other obstructions which will impede the free run of salmon and trout, and that the letter and spirit of the Klamath River Initiative Act of 1924 should be kept inviolate by both our National and State Governments; and be it further

Resolved, That copies of this resolution be forwarded to the President of the United States, the Secretary of the Interior, the Governor of the State of California, the California Development Association, and to all senators and representatives of California in Congress.—*Associated Sportsmen*, August, 1929, p. 16.

A SPORTSMAN'S CREED

1. I deem it a point of honor never to shoot a sitting bird (except cripples). I will not pot-shot, and I will not stand for it in my party.

2. I will measure the success of my day afield not only by the size of my bag, but by the cripples I leave behind me. I would rather get a mess of game with no

lost cripples, than to kill the limit and leave the woods full of lost game. Accordingly, I will shoot to kill, and I WILL NOT SHOOT OUT OF RANGE.

3. I am against "piecing out" the other fellow's limit. I am against the "dummy license." The legal limit applies to the man, not to the party. If I can't kill my own game, I don't want anyone else to kill it for me, and I expect my hunting partners to look at it the same way.

4. I will not clean out a covey. Leaving some for seed is one of the first principles of sportsmanship.

5. I realize the Montana game laws are made for my protection and to insure the future of my sport; therefore I will observe both the letter and the spirit of the law, and I will make it my duty to see that others do also.

6. I want to be a sportsman, not a meat hunter.—*Montana Wild Life.*

VETERAN FISH AND GAME CLUB

One of the oldest sportsmen's clubs in America is the Montgomery County Fish and Game Protective Club of Dayton, Ohio, its record of activities having extended over 43 years, according to the American Game Protective Association news service.

The object of this club as laid down at the time of its organization nearly a half century ago is stated as follows:

> The object of this club shall be the protection of all game, game birds and fish, and also the protection of song and all insectivorous birds beneficial to agriculture and horticulture; to procure the enactment of judicious and effective laws for such purposes; to maintain a vigilant supervision over the public officers elected or appointed to carry into effect all laws enacted for the propagation and protection of birds, game and fish; to rigidly enforce the laws so enacted, and also for the social and recreative advancement of its members.

This club has the unique distinction of having had the same man at its head throughout almost its entire history of 43 years, Edwin Best having served as president from its organization in 1886 to 1924, or 38 years.

POPULARITY OF STRIPED BASS FISHING

On Sunday, October 6, 1929, 1250 fishermen, by actual count, angled for striped bass along the Contra Costa shoreline between Rodeo and Pittsburg, San Francisco Bay region. The fishing was from the shore and from boats. The count was made by a party of Pittsburg Chamber of Commerce and city officials to obtain at first hand, facts and figures showing the need for a yacht harbor to accommodate amateur fishermen.

More than 160 boats were occupied by fishermen, the officials discovered. The fishing boats were so thick in the vicinity of Pittsburg that it was difficult to pass through. It was conservatively estimated by men familiar with fishing conditions in the lower rivers and bay areas that had the party returned via Montezuma slough and upper Suisun Bay this actual count of 1250 would have been practically doubled.

It looks like the story of the "tons of bait" consumed every Sunday is true, for each of the 1250 fishermen had at least three pounds of either sardines or some other form of bait for the day's fishing, making practically two tons.—*The Pittsburg Evening Dispatch*, Oct. 8, 1929.

FISH COLLECTION SECURED

Dr. Barton Warren Evermann, director of the Museum of the California Academy of Sciences, has secured for that institution the entire Indiana university collection of fishes. The collection is said to contain more than 200,000 specimens—100,000 of South American species and an equal number from North America and elsewhere. This collection was begun in the early '80s by Dr. David Starr Jordan and his students, among whom were Gilbert, Swain, Eigenmann, Evermann, Meek, Jenkins, Blatchley, Fordice, Fesler, Bollman, Snyder and others. It was more than doubled in size and value by Dr. Carl H. Eigenmann, who, during the period of his professorship at Indiana University (1891-1927), was indefatigable in carrying on personally, or directing, ichthyological explorations in South America. Upon the death of Dr. Eigenmann in 1927, the president and trustees of Indiana University, in view of the fact that there was no one left at that institution to carry on ichthyological studies, deemed it best to dispose of the collection. They wished it to go to an institution where it will receive the best of expert care and where it will continue to be utilized in research as it was for so many years under Dr. Jordan and Dr. Eigenmann and their students. President Bryan and his board of trustees no doubt felt a sentimental interest in having the collection follow Dr. Jordan and Dr. Evermann, his life-long associate, to California.—*Science*, Sept. 20, 1929, p. 291.

CARP IN PONDS

Carp get the better of other fish whose waters they invade, literally by eating them out of house and home. This has

been disclosed by the drainage of a small, carp-infested lake in southern Wisconsin, which was studied by Dr. Alvin R. Cahn, of the University of Illinois. His results are reported in the scientific magazine *Ecology*.

As the waters went down in the lake, all the fish were captured and counted. Out of a total of 6006 fish, 5891 were carp. More desirable species, like perch, black bass and pike, were notable for their absence or scarcity. By way of contrast, a similar total taken from a lake containing no carp had a good representation of several desirable game and food species.

The most notable difference between the two lakes, Dr. Cahn states, was to be seen in the plant population, which of course forms the ultimate food of all fishes. In the carpless lake there was an abundant growth of many kinds of plant life; in the carp-filled water there wasn't a weed. The restless, avid, all-eating mouths of the carp had destroyed every green thing.

The muddy bottom of the lake was entirely covered with little semi-round depressions about a quarter of an inch deep. These had been made by the carp, "mouthing" the mud to get the last trace of anything fit even for a carp to eat. Incidentally, of course, this constant stirring of the bottom effectually prevented the germination of any seed of a water plant that might have fallen into the lake, and also kept the water constantly roiled and muddy.—*Science* Supplement Vol. 70 No. 1819, November 8, 1929, p. x.

MONTANA BARS SALMON EGGS AS BAIT

Montana has recently legislated against the use of salmon eggs, real or imitations, as bait for trout. The new law was placed on the statute books as the result of concerted action on the part of sportsmen who realized that the continued use of salmon eggs threatened their future sport. The act applies only to the streams of the state, but it is probable that its provisions will be extended to lakes at the next session of the legislature.

The August 1929 issue of *Montana Wild Life* gives the act as follows:

The Fish and Game Commission is hereby granted authority to regulate, supervise and prohibit the use as fish bait of salmon eggs or salmon spawn, or any imitations or substance prepared therefrom, in any stream in this state whenever it deems necessary. Whenever the said Commission shall have made an appropriate order under the powers conferred upon it by this action, prohibiting the use of salmon eggs or salmon spawn or any substance therefrom, as bait in any specified stream or streams in the state of Montana, it shall be unlawful and a misdemeanor, punishable as in this act hereinafter provided, for any person to fish with or use as fish bait any salmon eggs or salmon spawn, or any imitations or substances prepared therefrom in the stream or streams designated by such order or orders.

WHALING OFF SAN CLEMENTE

The California Sea Products Company, San Francisco, reports its whaling vessel *Lansing* and the four "killer" boats are operating this fall off San Clemente Island, about 50 miles southwest of San Pedro, California. The fleet left San Francisco in March and operated off Lower California until June 27, when it moved northward to San Clemente.

Late in September the boats had taken about 200 whales and converted them into 12,000 barrels of oil. This was considered a good season, the catch running about the same as last year.

The boats will remain off San Clemente until the end of 1929. They did not operate in Alaskan waters this year and no shore stations were opened.—*Pacific Fisherman*, Vol. 27, No. 11, (October 1929), p. 50.

ROYAL DECREE SAVES WHALES

American scientists pay homage to a king who has linked arms with science to balk the threatened extinction of whales.

King Haakon VII of Norway has effected by royal decree a set of regulatory measures hailed by American conservationists as among the most constructive legislation ever drawn up to save the waning animal life.

Norwegian whalers, whose industry accounts for 75 per cent of the world's catch, are prohibited from capturing the smooth or straight-backed species, known as right whales, cows accompanied by calves, and calves accompanying a cow.

Gunners and crews of whaling vessels may not be engaged on terms which will make the pay for their work as whalers dependent solely upon the number of whales shot.

The king may prohibit whaling in tropical and sub-tropical waters within certain prescribed limits. Whalers must be registered with the government and a tax on whale oil has been levied to maintain scientific research in the industry. The handling of whale carcasses is prescribed to insure a minimum amount of waste.

"The regulations," according to Remington Kellogg and A. Brazier Howell, of the council for the conservation of whales, operating under the auspices of the American Society of Mammalogists, "are es-

FIG. 26. A study in style. Hunting licenses issued by the California Fish and Game Commission since the Hunting License Act was enacted in 1907. Collection courtesy of C. S. Smith, Paso Robles, California. Photo by E. S. Cheney, November, 1929.

sentially the same as those the council has been attempting to accomplish for all interested nations through some sort of an international agreement.

"Norway, by the royal decree, has accomplished more than all of the nations of the world. As far as conservation is concerned, the United States, Australia and South Africa, all vital areas, have yet to pass regulations. Japan alone, in addition to Norway, has intelligent legislation on the subject."—*San Diego Union*, October 13, 1929.

ALASKA RED-SALMON INVESTIGATED

GILBERT, CHARLES H. and WILLIS H. RICH. Investigations concerning the red-salmon runs to the Karluk River, Alaska. Bull. U. S. Bur. Fish. 43 (Doc. 1021) : 1-69. 33 fig. 1927.

A presentation and analyzation of all the available information relative to the biological and economical aspects pertaining to the red-salmon of the Karluk River. The paper begins with geographical and physical details of the setting. Detailed statistics of the catch from 1882–1926 are a basis for several conclusions. First a definite depletion is evident and a five-year life cycle is demonstrated and compared with scale studies. Original work was done with spawning and young fish. "Spawning occurs during the summer and fall, hatching in the spring. As a rule, the young remain in the lake for two full years after hatching, migrating seaward during the spring of their third year."

A few fish ran to sea during the spring of their first, second, fourth and fifth years. The period of the return of adult spawning fish varies from a few months

to five years. There are seventeen distinct age groups, representing different combinations of existence in fresh and salt water. Comparisons are made between these various age groups, between the sexes and between anatomical dimensions.

The article ends with some details on the methods used in the investigation and the possible future benefits and deductions which have been made possible.—PAUL BONNOT, San Francisco, California.

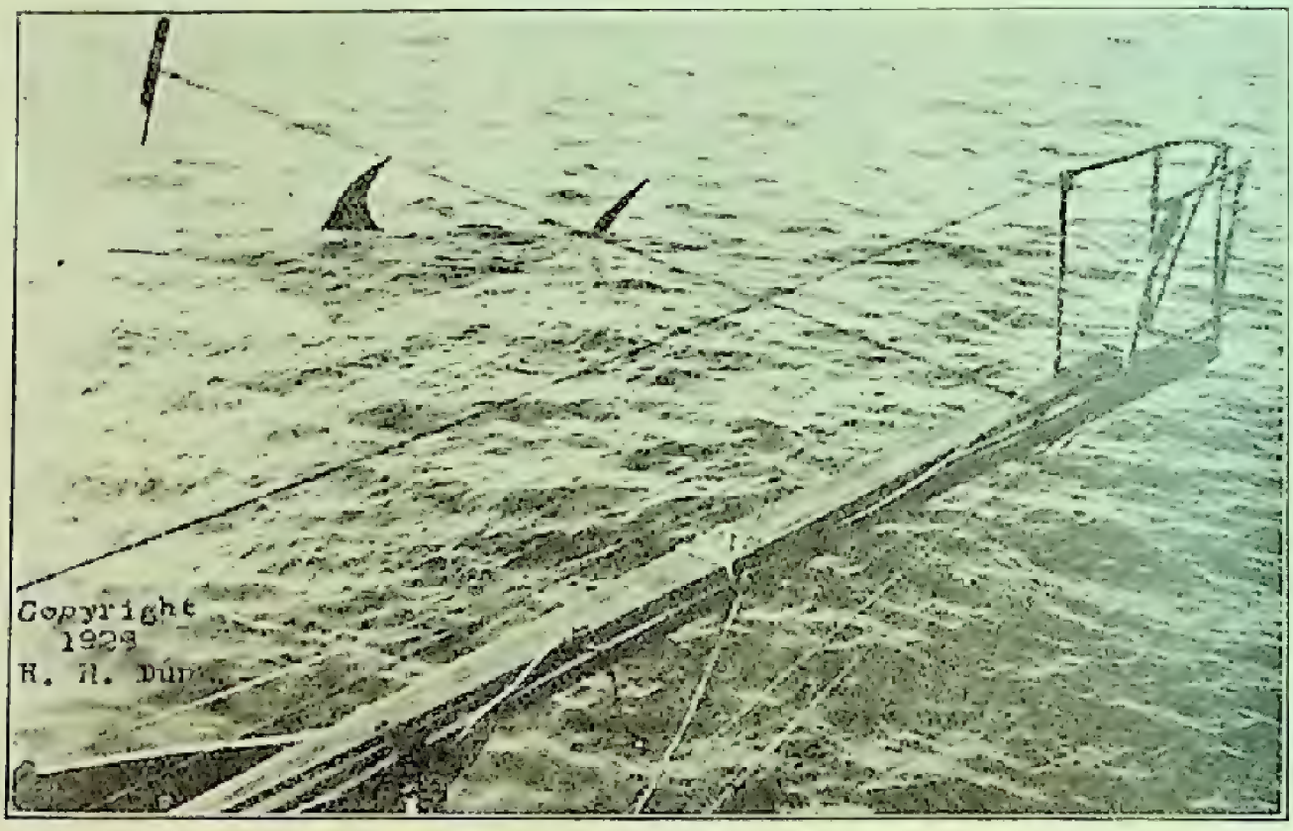

FIG. 27. Remarkable photograph of swordfish near surface of the sea. Photograph taken off Point Loma, San Diego County, California, by H. H. Dunn, June, 1929.

A SWORDFISH PHOTOGRAPHED

H. H. Dunn, of San Diego, California, while off Point Loma this spring saw a swordfish suddenly approach the surface of the sea. He just had time to focus his camera and snap. He states that the fish sighted the boat almost immediately and left for safer quarters with as much speed as it could display.

Photographs of swordfish as they actually appear when near the surface are rare. The picture herewith reproduced has been slightly retouched and the outline of the body of the fish under water accentuated. Otherwise, the photograph is a faithful reproduction of what the camera recorded.

GOOD BUSINESS INSURANCE

Bardon's, a sporting goods concern in Tulsa, Oklahoma, regards conservation as good business insurance for the future. The concern demonstrates this by actively cooperating with the state game department in the encouragement of license sales. The following advertisement appeared as a result of this policy:

"No true sportsman will go into the field with dog or gun without a hunting license in his pocket.

"This license is his contribution to the state game and fish department's expense of propagating and protecting wild life. Without such a department functioning properly, game soon would be shot out and there would be nothing left to hunt.

"Therefore, it should be considered a pleasure to be permitted to assist, in this small way."

CARELESS GUNNERS WARNED

Regardless of the amount of campaigning and warning against them the number of serious or fatal accidents occurring during the hunting season seems to increase in much the same proportion as the increase of gunners, says the American Game Protective Association news service. Most state game commissioners, many newspapers and other agencies circulate printed warnings intended to decrease the number of such accidents. During the present season each licensed hunter in New York receives the follow-

ing instructions for preventing hunting accidents, which is printed on the back of his license:

"Never carry loaded guns in automobiles or other vehicles.

"When afield hunting birds, keep abreast of and know the exact location of your companion.

"In loading never point a gun in the direction of your companion.

"In climbing over stone walls and fences, first break or unload your gun.

"A bird quartering to the right in the vicinity of your hunting companion should never be fired on by a hunter on the extreme left and vice versa.

"Never leave a loaded gun standing against a tree or lying on the ground where a dog may get at it.

"Always keep your gun pointed away from your companions when you stop to talk.

"In handing a gun to a person for inspection be sure it is unloaded.

"Never shoot in the direction of your companions because you consider yourself a good marksman. You are taking a dangerous chance.

"Carry a gun pointed down to the left. If you shoot left handed, walk at the extreme right of the party.

"At all times be careful."

SEA GULLS AID FARMER

Nature has provided birds with a truly remarkable sense of detecting when food supply becomes abundant in a certain area. When insects multiply in such numbers as to seriously threaten growing crops, nature, if left to her own resources, will frequently provide the remedy in the form of an army of birds flocking in from all quarters.

Sea gulls, much maligned as destroyers of duck eggs are, nevertheless, ever present friends of the farmer. They may be seen in many newly plowed fields following the plowman and devouring the upturned bugs and worms. They thus have a value as insect destroyers and save the farmer many dollars.

They also suppress plagues. A classical instance occurred during the Mormon occupation of Utah. Grasshoppers one season were devastating the grain crops and the Mormons were facing starvation. The Mormon church prayed in a body for deliverance from the pests. As the story goes, uncounted numbers of sea gulls appeared and checked the plague. In Temple Square, Salt Lake City, a striking monument to the sea gull commemorates this deliverance.

From Salt Lake City comes the report that sea gulls have rescued the farmer again. Field mice had grown a pest in the vicinity of the American Falls reservoir on the Snake River, southern Idaho. A. E. McClymonds, superintendent of the agricultural experiment station at Aberdeen, states that the gulls in increasing numbers have moved in and are controlling the mice.

NEW DANGER THREATENS WESTERN DEER

The strange malady that has taken heavy toll of deer in Oregon and Washington during the last two years may be identified as the activities of the head maggot, according to information received from the United States Bureau of Entomology. The American Game Protective Association, in a recent bulletin, has the following to say on the subject:

Inquiry of the U. S. Bureau of Entomology elicits the information that there are two or more distinct species of nose flies that affect deer and elk in this country. The life history of these is not well understood but presumably the young are deposited as minute active larvae in the nostrils of the deer. These larvae immediately work up the nasal passages and attach in the nose, throat and sinuses of the head, where they complete their development in about a year and drop out as full grown spiny larvae about two-thirds of an inch in length. These in turn transform on the ground to flies which, after mating, immediately begin to attack the hosts. The presence of these larvae in the heads of the animals causes irritation and sometimes pus formation is induced. These larvae would naturally tend to lower the resistance and conditions of animals affected so that they might die from other causes.

What can be done to bring these insects under control is a question which can not be answered until they have been more carefully studied. Post mortem examinations of deer which died in the Gunnison forest last winter showed that head maggots were possibly a contributing factor in these losses. Animals so affected lose their appetites, become emaciated and fall easy prey to any adverse factors such as severe weather and feed shortage.

It is said by those who have made investigation that the species of fly which infests the deer is not the same that attacks domestic sheep. So far as known the species found in deer doesn't attack sheep but it has been identified as the same species that attacks the reindeer of Alaska.—*Western Out-of-Doors*, September, 1929.

AGRICULTURAL SETTLEMENT IN CANADA AND THE WATERFOWL SURVEY

At the Twenty-third Convention of the International Association of Game, Fish and Conservation Commissioners, Hayes Lloyd, in charge of migratory bird protection in Canada, presented a paper on the breeding grounds of ducks, geese and swans of North America. Maps showing the northern limits of the breeding range of most North American species ably bore out the fact that the most important wild fowl breeding area is in western Canada. With the exception of the black duck and the pintail, the greater majority of ducks hunted for game in America have a southern and western range. Unfortunately this breeding area coincides with the agricultural area now being occupied by settlers. There is no evidence, according to Mr. Lloyd's findings, that "if any of the wild fowl species should be dispossessed by agriculture that they would succeed in establishing themselves outside of their primitive range."

In closing his paper Mr. Lloyd said, "Bird species seldom move from their breeding range. Man has occupied and altered a great deal of the range formerly possessed entirely by wild life, and man will migrate northward according to his own free will and the availability of food and occupation. Probably the lesson from this is that a very definite restriction of the capital supply of wild waterfowl can be expected ultimately, not because of poor conservation, but because of the advance of human population throughout the waterfowl breeding area.

"Human advance of this kind to occupy the fertile lands suited for agriculture in western Canada will not be stayed, but it rightly gives cause for thought to those who wonder where the ducks will come from twenty years from now. Given breeding stock, Canada will continue, without any doubt, to send south a good supply of wildfowl each fall; but there is no use denying that times are changing and that there are causes at work in the north, beyond a game protector's control, which should make us value very highly and guard carefully our wild waterfowl stock."

SAVING THE GAME

Conservation leaders have worried greatly concerning the future game supply. The average sportsman bemoans the "passing of the good old days," but mighty few of them do anything to bring them back. Even the small hunting license fee is often paid grudgingly. Many thousands of dollars have been spent to enforce laws and to buy game for stocking purposes, but regardless of the fact that it has been proved that what game needs more than anything else is a chance to live and reproduce its kind, little has been done to produce suitable natural conditions for wild life.

Frequently there is considerable feeling between farmers and sportsmen. There should be no occasion for it. The farmers supply a large part of the hunting ground in America, and the sportsmen supply the funds to protect both the game and the beneficial song and insectivorous birds which make possible the crops of the farmers. They, therefore, face a common problem.

Intensive farming means no game cover, and no food for winter. Game birds such as the bobwhite, the Hungarian partridge, the ringneck pheasant, the prairie chicken and others in many of the northern states will face starvation. One small covey of birds saved now in their natural habitat is worth more than a whole crate of imported birds released next spring.—SETH E. GORDON, *Outdoor America*, October, 1929.

STUDY OF PHEASANT FOODS

According to *Public Opinion*, Watertown, South Dakota, contents of the digestive systems of more than 100 Chinese ring-necked pheasants have been analyzed at State College since April 1, in connection with an investigation to determine the relation of the game birds to South Dakota agriculture, it was indicated by a report by H. C. Severin, professor of zoology and entomology at State College, who has supervision of the project.

Some of the birds already examined include the following, as set out in the report:

One struck and killed by a car when eating corn in the middle of a graveled highway near Mitchell. Its gizzard and crop contained corn almost exclusively, although 372 fine stones and 5 yellow-foxtail and 4 wild-buckwheat weed seeds were also discovered, as well as a few insect parts.

Another was taken from a corn field near Huron. The corn was approximately six inches high. The crop contents of this bird were: 61 kernels of unsprouted corn, 21 of oats, 6 barley, 1 wheat, 1 spider and 38 cutworms. The gizzard contained 4 kernels of unsprouted corn, 25 cutworms, 5 oats, 1 barley, 1 yellow-foxtail weed seed and 357 small stones. The corn eaten by this bird was undoubtedly waste corn, in the opinion of Professor Severin.

FIG. 28. Spike buck hit by automobile near Flinn Springs, San Diego County, California. August, 1929. Photo by E. H. Glidden.

The crop of another bird, taken from a small grain field near Mitchell early in the spring, when snow was on the ground, contained 258 kernels of oats, 146 of barley, 17 wheat, 75 sweet clover, 1532 yellow-foxtail weed seeds, 5 Russian thistle, 16 wild buckwheat, 2 lamb's quarters, 48 green foxtail and 2260 stones, or less than about one-fifth of a teaspoonful. The gizzard contained: 1886 stones, 3 oats, 5 barley, 23 sweet clover, 94 yellow foxtail, 1 wild buckwheat, 2 green foxtail and 9 wild rose.

The investigators, with some assistance from a microscope, discovered 247 fly larvae in the crop of a pheasant taken near Pierre. They reported 4 wheat kernels, 2 wild sunflower seeds, 1 green foxtail, 1 yellow foxtail and 1 knot-weed seed; and in the gizzard 30 fly larvae, 1 wheat seed and 63 stones, larger than the size usually found.

Another pheasant was taken recently in southern Butte County from a field of oats that had been in wheat last year. The bird had been in the field 45 minutes. Its crop contained 492 wheat seeds, but no oats. The gizzard held 151 stones and 88 grains of wheat.

Still another bird taken from a corn field in Deuel County early in June, had consumed the following meal: 11 kernels of corn, 12 barley seeds and 4 oats.

One taken from a Hughes County wheat field that was 18 inches high June 24, had lunched on 79 grains of wheat, 53 seeds that were expected to be identified as weed seeds and 10 small stones. —*Dupont Promotion News Bulletin*, No. 43, September 30, 1929.

THE AUTOMOBILE AND CONSERVATION

Interesting facts and figures compiled by the Automobile Club of Southern California show that California's motor vehicle population has increased enormously during the past fifteen years. On January 1, 1914, the number of registrations was 123,516. These had increased to 1,859,523 in 1929; at least fifteen times the figures of 1914. Ten years ago, the average day's drive by California motor tourist was about 100 miles. Today 234 miles constitutes a day's journey. The average annual mileage of motorists is estimated at 11,000 miles a year. The time element, as well as distance covered, enters with striking effect. Twenty-five years ago, A. H. Pilenburg created a stir in motordom by an unprecedented feat. He drove from San Diego to San Francisco, 750 miles, in six and one-half days.

All these facts have a bearing on the conservation of fish and game in California. Good roads have removed many of the old-time hardships and difficulties of hunting and fishing, so that sport is a highly pleasurable and alluring pursuit. And as this "army on wheels" continues to increase, it will increase the yearly draft drawn on the supply of fish and game. The state law now makes it unlawful to shoot from an automobile, whether the machine is moving or not and prohibits the use of an automobile to drive game.

Motorists, aside from those who hunt and fish, should give some consideration to the welfare of animals. Large numbers of valuable game birds and mammals are run down. The greatest number are killed at night, when the animals are blinded by headlights. Motorists will contribute to the enjoyment of future generations if they will apply their brakes or exert sufficient effort to avoid killing game on highways.

LONGEVITY OF PINTAIL DUCKS

How long does a wild duck live? Banding operations of the United States Biological Survey have solved many problems on bird migrations. They have also thrown much light on bird secrets. A pintail duck recently shot in California carried a band placed on its leg at Bear River, Utah, twelve years ago. This is believed to be a record.

NAMES OF DUCKS CHANGE

Probably few waterfowl hunters ever heard of the smoking ducks, according to the *Journal*, Flint, Michigan. Yet that is the name by which the widgeon was frequently known 50 years ago, for the reason that its call was thought to resemble the sound of a smoker puffing on his pipe.

For that matter, it is to be doubted if the modern wildfowl gunner would recognize many of his targets by their names of a half century ago.

Many of these titles were bestowed on the ducks by the market hunters and have passed into oblivion along with the clan from whose language they came.

For instance, eastern market men claimed to furnish their patrons with three varieties of mallards in the late 70's and 80's.

These were the greenhead, the gray mallard and the black mallard. The gray mallard was the female greenhead, commonly believed at that time to be a separate species. The name black mallard has lived and the black duck today is known by that title more frequently than by its rightful name.

To the old-time gunners, the green-wing teal was known as the winter teal, the bluewing as the summer teal. The wood duck boasted the names of tree duck and acorn duck and was rated as one of the finest of wildfowl for table use.

From its habit of rafting in huge flocks, the bluebill was called the flock duck, raft duck and troop fowl. The merganser was known as the shelldrake even in the early days. Sometimes however, he was called the sparling fowl, sparling being the ancient English name for smelt on which the merganser fed in that country.

From its agility at diving at the flash of a gun the golden eye won the title of spirit duck. It was known too as the whistler, a name that has lasted, and as the jingler and among the eldest of the gunners as the merry-wing.

The coot was hunted under a host of names in that day as now. It was called the mud hen, marsh hen, pond hen, water hen, sea crow and crow duck. Despite its unflattering names, however, it was held in high esteem for the excellence of its flesh, especially when fattened in the rice fields.

The king rail and gallinule were commonly known as marsh hens.

The Canadian goose was known among gunners as the gray goose, the bay goose and the reef goose. The smaller Hutchins goose was called the mud goose, the winter, barnacle and Eskimo goose. By some hunters this wild fowl was believed to spring from the shell of a small barnacle.

The brant won its name from its dark color, being first called the brant goose, meaning branded or burned goose. It ranked high on the table and was especially fine when killed in late spring, so the term May brant held much significance for epicures.

RAINBOW TROUT TRAVELS 140 MILES IN 60 DAYS

How far will a fish travel?

This is a question of endless debate, not only among fishermen but among fish-culturists the world over. What might be a record in distance traveled by a fish in a short time was reported recently by Raymond E. McDonald, a fisherman of Kenosha.

On June 24, Mr. McDonald caught a rainbow trout 14 miles southeast of Kenosha, in Lake Michigan, which had a Michigan fish tag pinched onto the lower side of the face. Investigation showed that this fish was tagged on April 24 at Foxes Bridge on the Little Manistee River, 20 miles inland in the state of Michigan. This fish had traveled at least 140 miles in 60 days.—*Monthly Survey*, Wisconsin Conservation Commission, May–July, 1929.

AN UNIQUE RECORD

The vigilance of the law enforcement department of the division is well borne out in a recent report of the Automobile Club of Southern California. It is the boast of DeLuz, a small community in San Diego County, twenty miles north of Oceanside and sixteen miles east of San Clemente, that its inhabitants are entirely law-abiding and probably can claim uniqueness in this respect. An old-time resident is authority for the claim that only three times in more than fifty years has an officer of the law paid an official visit to DeLuz—a deputy sheriff once called to take a mentally deficient child to a state institution, a fire warden came to serve notice of a fire hazard on a landowner, and a game warden once made an arrest of a northern visitor who had exceeded the bag limit.

BADGERS AND THE FUR TRADE

The present demand for badgers is one of the sensations of the fur trade. The badger is the latest animal to achieve the distinction of being regarded as fine fur. The trade is divided on opinion as to whether the badger will hold the place it has gained so recently. Some authorities say it will not, while others have unlimited faith in the future of the article.

The badger must earn his place as a ranching (fur farming) subject. He seems a contented captive even if the hissing noise he makes when disturbed is hardly inviting. The individuals seem to thrive in the pens on the food the ranchers provide for them. But more than this is necessary; more even than the prices of $60, and even upward which the fur market at present is willing to pay for fine Canadian badger skins. The lady badger must weigh in with a fair-sized family. Up to now the litters have been small, too small for economic ranching. But of course the seed stock has only recently come from wild sources and has not had a fair chance to become adjusted to domesticated conditions. Some ranchers claim the badger can produce up to nine young and in support of this statement they point to the number of milk outlets with which the female is equipped. It seems reasonable and probably will be proved by actual births. The pioneer domesticators of mink had

much the same experience.—*Sports Afield*, vol. 84, No. 2, October, 1929.

THE FUR SEAL CROP

The U. S. Bureau of Fisheries reports that, barring a few additional skins that may be taken during the reserving operations, the regular summer sealing season at the Pribilof Islands ended July 23 with a take of 39,253 fur-seal skins. Of these, 32,701 were obtained on St. Paul Island and 6,552 on St. George Island. The total take through the summer season in the previous year was 30,298 skins, or 8,955 fewer than in the present season. These figures are exclusive of fall killings, which add several hundred skins to the total.

The take of fur-seal skins at the Pribilof Islands in the season of 1929 is the largest since the government took over sealing operations in 1910 following discontinuance of the leasing system. The next largest previous take by the government was in 1918, when 34,890 skins were secured.

The take in 1929 is the largest at the Pribilof Islands in 40 years, or since the take of 100,00 skins in 1889, which was the final year of the first 20-year lease of the sealing privilege to a commercial company.

INTRODUCTION OF PLANT-EATING SPECIES THREATENING FOREST GROWTH

No better example is furnished anywhere of the folly of introducing exotic species of animals in any country without careful investigation of their habits than is offered at the present by New Zealand. These oceanic islands, which have been separated from other lands for countless ages, have developed a flora and fauna peculiarly their own. Animals, birds and fishes from other parts of the world have been introduced there indiscriminately. In some instances the results have been beneficial, as for instance in the introduction of rainbow trout, but it seems, according to the New Zealand Native Bird Protection Society, to have been a mistake to introduce plant-eating animals extensively, as has been done.

During the process of evolution a forest has been developed there which will not permit the presence of plant-eating animals. These forests existed for countless ages without any such animals to feed upon them and now that deer, elk, goats, opossums and the like have been introduced the results are unfavorable to the forest.

It is claimed in literature of the society above mentioned that it will be necessary to exterminate these animals in order to save the forests from disappearing. E. V. Sanderson, honorary secretary of the New Zealand Native Bird Protection Society, writes the American Game Protective Association that bird life, once exceedingly plentiful in New Zealand, is being badly depleted through misdirected effort in the introduction of new species of animals.—*Dupont Promotion News Bulletin*, No. 44, October 14, 1929, p. 126.

AIRPLANES AND GAME

The airplane is proving both friend and foe of wild life. As a menace to the welfare of game, it ranks paramount in the ease and speed with which it enables the hunter to reach remote wilderness areas. It is especially effective as a means of concentrating wild fowl by rallying and driving. A federal law declares the use of the airplane for such purposes as an illegal method, while the state law forbids the shooting of game from an airplane. That eternal vigilance is necessary to enforce these laws is evidenced by a report of the Biological Survey. Since the enactment of the Migratory Bird Treaty Act, thirty-two violators have been brought to justice.

The same features which render the airplane so deadly can also be turned to good account. The Alaskan Game Commission has utilized it with splendid results to take game censuses. In one flight over the Big Delta southeast of Fairbanks, Alaska, region, a vast area was scanned in a brief space of time.

For several years, fawns from the famous Kaibab herd have been transported by truck 240 miles to the south rim of the Grand Canyon where deer have become scarce. This year the stocking was done by air transportation and in three hours a distance was covered which required from 24 to 30 hours by the old method.

MENACE OF FLOATING REDUCTION PLANTS

The floating reduction plant has again raised its head to add to the patrol duties and increase the vigilance of the division. The tanker *Lake Miraflores* belonging to Stanley Hiller has appeared in southern waters off San Pedro. The apparent intention of the operators is to take fish outside the three-mile limit for reduction purposes.

The division is faithful to a policy that food fish shall not be used for the manufacture of fertilizer, fish oil, fish meal

and other products not used for human consumption.

Immediately upon learning of the proposed operation of the *Lake Miraflores*, patrol boats were set out to sea and are carefully watching for the ship. It is reported that several tons of sardines have been handled in the plant aboard the ship. It is the contention of the division that only a small percentage of the sardines run outside the limit where the ship proposes to take fish and that in order to secure fish, those fishing from the ship must poach on the state fishing grounds.

The first gun against floating reduction plants was fired in the action taken against the *Peralta* in October of 1926. This was a concrete ship without motive powers which was towed into Monterey Bay and anchored as a reduction plant. The Fish and Game Commission succeeded in stopping the operation of this plant through legal processes and had a court skirmish with the owners of the *Lake Miraflores* shortly thereafter. Following this action, the *Lake Miraflores* departed for northern waters and had not been the source of alarm until its recent reappearance off the southern coast.

THE SPIRITUAL RESOURCES OF NATURE

When our coal and oil are exhausted, the scientific experts can doubtless give us some substitute. But no scientist, says another nature lover, "can give us back anew those high developed organisms of the plant and animal world which man today is recklessly sweeping out of the list of living things. They can not restore to us the green woods and their animal life. We preserve with punctilious precision every vestige of the art of the past. The older the documents of earlier historic times, the more eagerly they are coveted, the more highly they are valued. Our collectors gladly pay the largest sums for an old papyrus, an old picture, an object of decorative art, or a marble statue. * * * But the same man who, in this respect, acts so reverently, so conservatively, looks on with folded arms while treasures are destroyed that ought to be guarded with special affection and care, in these times when the great value of all natural science is so fully recognized." Let archeology wait. The relics of the men of a former time will be in the ground a hundred years from now. But the rescue of the * * * animals can not be delayed. * * *

But mankind, not the animals, is the great sufferer. Sad as is their physical death, it is even sadder to see the shrinking of our own intellectual and spiritual resources as nature is unhorsed. For just as we need the forests in order that we may keep our water supply, so we crave the living things of the wilderness for our spiritual enlargement. Man is stripping a vast playground of the beautiful creatures that give it life. What will our children and grandchildren enjoy most, the stuffed specimens in museums, or the living creatures in their own home. * * * For many thousands of years, our ancestors were hunters, herdsmen, shepherds, tillers of the soil, fishermen, sailors; however adapted our intellects have become to the age of machinery, our instincts still point to the outdoor life of the wilds as one great source of our deepest enjoyment. Like love and worship, so hunting, fishing and exploration are portions of our nature of deepest and remotest origin. They are as much a part of a man as his hands. We need a place in the world where we can recapture "The lost arts of wildcraft" in such surroundings, because "the self-dependent life of the wilderness nomad brings bodily habits and mental processes back to normal, by exercise of muscles and lobes that otherwise might atrophy from want of use." That there is a dash of the gypsy in everyone is simply a sign of our wholesomeness, and of a past which our natures can not wholly forget.—HENRY R. CAREY, *Journ. of Mamm.*, May, 1926, pp. 76–77.

EDUCATION vs. FORCE

It is the belief of Captain Walter Sellmer, Fairfax, California, that the division's program of education should not neglect the violator. In fact, emphasis should be placed on efforts to win the violator over to the cause of conservation.

Joe Morris was convicted of shooting a deer with the aid of a spotlight and was sentenced by Judge H. De la Montanya to serve six months in the Marin County jail.

"In presenting Joe Morris with small gifts and visiting him occasionally, it was my object to gain his friendship," writes Sellmer. "A man in jail has plenty of time for thought; he is lonely and glad to have someone to talk to. Even an arresting officer is welcome.

"If it can be possible to bring about a better understanding of the laws for the protection of our wild life, it is my wish that it should be done.

"To tread upon a man who is down is all wrong in my estimation. I believe

there is a better way than by throwing slurs at one another. Education has done wonders in our work, and can best be accomplished with a closer contact with those who have fallen.

"Because a man is down, is no reason to believe that he is out. He may still be able to get up and be among the best of our present citizens and lead a life which is unquestionable. None of us are perfect, and we do not know what the future has in store for us."

THE ROOTS OF WILD LIFE

We preach game protection, we talk it, we have elaborate laws enacted, but these efforts, good though they are, avail little so far as wild life is concerned unless we go to the roots of the problem which are to be found in the roots of the forests.

These widespread changes in the course of nature so destructive to bird and animal life are equally destructive to fish life. Take for example the black bass which from the day he is hatched lives only on live food. If the roots of the forests are the nurses of rivers in birth, they are also the gardens that feed our inland fishes and purify their waters. Dr. Charles Reitell, of the University of Pennsylvania, declares that to successfully raise black bass we must have live food and provide a vegetation which will bring into being a live food supply for the millions of black bass. By cutting our forests we have in part at least cut off this live food supply. Springs and small brooks have dried up and periodic droughts have killed plant life upon which the live food of the bass is dependent.

"This depletion of the great sponge," declares Dr. Reitell, "not only means death to the food of fish in drought periods, but likewise plays havoc in flood times. Muddy water carrying sediment in great quantities deposits it upon all forms of water vegetation, smothering and hampering its growth, while in excessive storm periods tremendous quantities of food-bearing vegetation and larvae are torn from their moorings and carried off." What is true of the black bass is true in one form or another of other game fish. We are working against terrific, indeed impossible handicaps when we attempt to propagate fish in stream whose waters and food supply are devoid of forest influences.—"Forestry in Relation to Game," by George D. Pratt, *American Forests and Forest Life*, vol. 35, No. 6, June, 1929.

AUDUBON BIRD PICTURES AND LEAFLETS FOR BIRD STUDY

The National Association of Audubon Societies announces in a bulletin of the American Game Protective Association that through the generosity of its friends it is again enabled to furnish large numbers of colored bird pictures and leaflets to school teachers and pupils of the United States and Canada.

The plan is very simple. The teacher may explain to the pupils that they are going to form a Junior Audubon Club and have a few lessons, from time to time, about some of the more common North American birds. The teacher will also explain that each child wishing to be enrolled must bring a fee of 10 cents in return for which he will receive a set of six beautifully colored bird pictures made from original paintings by America's leading bird artists. Accompanying each of these pictures, also, there will be a leaflet with four pages of text, written by well-known authorities on bird life. This will tell in an entertaining way about the habits of the birds, their courtship, their songs, their nests, their food, their winter and summer homes, their travels, their enemies, and many other facts of interest. There is furnished, too, with each leaflet an outline drawing of the bird which the pupil may fill in by copying from the colored plate. Every child receives in addition a beautiful Audubon button of some favorite bird in color, which is a badge of membership of the club. A new set of pictures and leaflets is furnished each year to all who wish to repeat this plan of bird study.

Every teacher who is successful in forming a club of 25 or more receives free a year's subscription to the magazine *Bird-Lore* which is the world's leading popular periodical devoted entirely to birds. When a teacher is unable to form a club of as many as 25 a subscription to *Bird-Lore* is not given but the bird-study material is supplied the children where as many as 10 are enrolled. This undertaking costs the National Association of Audubon Societies 20 cents for every child enrolled, which means that the material is actually furnished at half the cost of publication and distribution.

MOUNTAIN BEAVER SUBJECT OF NEW BULLETIN

An account of the life history, feeding habits, and methods of control of the mountain beaver, a rodent inhabiting the Pacific Northwest, is contained in a new Farmers' Bulletin just issued by the Uni-

ted States Department of Agriculture. The bulletin is based on an extensive study of the mountain beaver by the author, Theo. H. Scheffer, associated biologist of the Bureau of Biological Survey, stationed at Puyallup, Washington.

In its natural haunts in the forest, says Mr. Scheffer, this interesting little burrowing animal, also variously termed sewellel, boomer, or whistler, did not materially affect man's interests, but with his clearing of lands and extension of farming operations it has come more in contact with agriculture. It has increased in numbers, and in many localities has become a serious crop pest, as it will eat almost anything the farmer or orchardist can grow. The animal lives only in the Pacific coast country of North America and may be found in almost any wooded situation where the soil will permit fairly easy burrowing. It is more numerous, however, on the slopes of the ridges and foothills and along the sides of the many gulches that cut through the bench lands.

The hay rancher of the Northwest, Mr. Scheffer says, sustains some damage in clover and meadow grasses from the mountain beaver, but the gardener and berry grower have more cause for complaint. Strawberry plants, kale, cabbage, mangel tops, raspberry canes, pea vines, and the like form the bulk of the plunder. The valley rancher is particularly annoyed by the animal's persistent habit of frequenting and clogging up the blind ditches that drain his land. Damage to highways by mountain-beaver burrows passing under the roadbed has been reported by engineers. Although mountain beavers can not climb trees, they readily ascend the taller shrubs and saplings, both deciduous and evergreen, and trim off the terminal shoots for food, using the stubs of the branches as the rungs of a ladder to assist them in climbing. In winter, they girdle second-growth evergreens at a height, sometimes, of three feet or more from the ground.

The Biological Survey does not recommend a campaign of extermination against the mountain beaver, but realizes that measures must be taken to keep it within bounds in agricultural districts. Methods for trapping the animals and directions for preparing baits for poisoning them are given in detail in the bulletin.

Copies of the new Farmers' Bulletin 1598F may be had free on request addressed to the United States Department of Agriculture, Washington, D. C.

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RESEARCH, CONSERVATION AND CONTROL ACTIVITIES OF THE BUREAU OF BIOLOGICAL SURVEY

That the first requisite in wild life administration is an adequate knowledge of all the facts regarding the wild animals and birds of the country—their relationships and economic value, their habits, and their abundance—is stressed by Paul G. Redington, chief of the Bureau of Biological Survey, in his report to the United States Department of Agriculture on the work of the Biological Survey. Only with such facts known can the wild life of the country be administered on a sound scientific basis and the harmless and useful species protected and those that are economically injurious controlled.

The report elaborates on the research work of the bureau concerned with the distribution and abundance of migratory birds, conservation of big game mammals, habits of the wild life of forest areas, and with the food requirements and feeding habits of useful and harmful birds, rodents, and other forms. It presents the results of cooperative studies in the propagation of quail and other game birds of experiments at the bureau's fur experiment stations and on fur farms in raising fur-bearing animals in captivity, and of investigations for the improvement of reindeer in Alaska.

The control of predatory animals and injurious rodents has the background of scientific research, both as to the habits of the various species and as to control methods to be applied. These methods are furthered and extension of needed work is made possible by the cooperation of states, farmers' and stockmen's organizations, and individuals. Campaigns against injurious species are not directed toward the extermination of any of the interesting native wild animals or birds, but toward local control only of those that become detrimental to farming, stock raising, or other economic interests, or to game and other useful wild species.

"In recent years it has become evident that close seasons on game birds, bag limits, and restrictions imposed upon gunners will prove ineffectual unless suitable habitat of wild fowl is preserved. There has been a constantly decreasing acreage of water and marsh area in this country, aggregating many thousands of square miles. The passage of the migratory bird conservation act during this year is a national recognition of the great importance of the birds of North America as a food supply, as an incentive to healthful sport, outdoor study, and recre-

ation, and as aids in the development of agriculture," says the report.

Mr. Redington emphasized the need for facilities for the adequate administration by the Biological Survey of the 82 bird reservations already under its jurisdiction, pointing out that without proper administration "many sanctuary areas have no more value as wild life refuges than have adjacent unprotected lands."

In discussing the value of wild life refuges for public recreation, Mr. Redington says that this feature "deserves development to the greatest extent possible consistent with the use of these areas as refuges for wild life. Each year increasing numbers of students of wild life and others visit the big game preserves and bird refuges. Facilities at these reservations are not yet sufficient to allow the public to enjoy them to the fullest extent possible without danger to themselves or molestation of the animals.

"Under most conditions, the successful administration of a refuge requires constant supervision. Game and food species must be protected against encroachments by poachers and often against such destroyers as forest fires. There are likely to be periods during which some predatory forms must be controlled. On the other hand, overabundance of the species to be protected may become a serious menace to their welfare, and arrangements must then be made to prevent overgrazing by disposing satisfactorily of the surplus."

Preliminary work looking toward the establishment of the new migratory bird refuges, authorized by the migratory bird conservation act of February 18, 1929, is under way. At the close of the year authority had been provided by special state legislation for the federal government to acquire lands for migratory bird refuges in nine states, and in 17 others the existing legislation is considered to be sufficient for the purpose.

Conservationists, sportsmen, and trappers are all interested in obtaining maximum returns from the administration of laws protecting big game, game birds, and fur bearers, and there has been insistent demand in the last year for an extension of the law enforcement activities directed by the Biological Survey. The occupation of a game protector is hazardous work, and lack of protection in the performance of his duties not only diminishes the effective execution of the police powers conferred but provokes contempt for the law.

"In its research on wild life, its control operations, and its conservation activities, the federal government, through the Bureau of Biological Survey, supplements the efforts of each of the states to protect the species which live there and are enjoyed by its citizens. This work of the federal government can be successful only through the whole hearted cooperation of the states and the people generally, and it may be recorded here that such cooperation is being extended in increasing measure."

SWANS DO NOT DAMAGE DUCK-FOOD PLANTS

Charges by some sportsmen that swans in the Currituck Sound and Back Bay region of North Carolina and Virginia were damaging wild duck food plants have recently led to an investigation of the matter by the Bureau of Biological Survey of the United States Department of Agriculture. Last summer, at the height of the growing season, when evidence of last year's damage by the birds to the aquatic plants would be most apparent, two representatives of the survey visited a favorite waterfowl feeding ground of this region and found the area as well stocked with vegetation as any in the neighborhood and no evidence of destruction of the roots of wild fowl food plants.

These findings prove conclusively that in their feeding operations swans leave enough fragments of the rootstocks of the plants or enough seeds to renew full growth the next season and reduce the damage that these birds are alleged to cause merely to the consumption of the quantity of aquatic plants required to support them during winter.

Because of their scarcity, both the trumpeter swan and the whistling swan are accorded protection in this country throughout the year. So long as it is deemed advisable to protect these birds to guard against their extermination, they should be allowed a sufficient supply of food, says the Biological Survey. In general, competition for food between other wild fowl and the swans is scarcely direct, as they feed to a large extent in different areas.

HELP WANTED IN PROTECTING WILD LIFE FROM INSECTS

In connection with their work on the study of insect parasites of domestic birds and animals, entomologists of the United States Department of Agriculture, wish to obtain specimens of external parasites of all wild birds and animals, especially the game species. Specimens from hunting dogs are also desired. Any informa-

tion concerning abundance, distribution, bird or animal hosts, and possible methods of control is especially valuable, and it is hoped that all persons able to collect specimens or such information will cooperate with the Bureau of Entomology in this study.

These insects and related forms, including the biting lice, sucking lice, fleas, bird flies, mites, and ticks, cause loss of life or lowered vitality among our wild birds and animals and it is hoped that eventually this loss can be reduced by the development of methods of control of at least some of these parasites.

During the life of the host, the lice, fleas and mites are commonly found under the feathers or hair, close to the skin. At death, as the body cools, they usually crawl to the ends of the feathers or hair and are then easily picked off with a pair of small tweezers or even with the fingers. For preservation they can be put directly into small vials containing a 70 per cent solution of grain or denatured alcohol or a 3 per cent solution of formalin. Each vial should be carefully labeled with the correct name of the host, date, locality, and name of the collector. It is important to place parasites of only one host species in a single vial and to avoid any possibility of the mixing of specimens from different species of hosts, as may easily occur where birds are placed in collecting bags or game bags in the field.

The Bureau of Entomology will identify any specimens sent in and will send small vials of preservative to persons interested in aiding to this study. Specimens and correspondence may be addressed to F. C. Bishopp, Bureau of Entomology, United States Department of Agriculture, Washington, D. C.

DIVISION ACTIVITIES

In October, the executive officer started holding staff conferences. The first meeting was held on October 19, the heads of all bureaus being in attendance. Executive officer John L. Farley explained the purpose of the meetings, and insisted that those present be prepared to talk, not only on the work of their own bureaus, but to be ready to discuss subjects of general interest.

At these meetings important matters regarding the operation and policies of the various bureaus, the methods of enforcing the laws and the carrying out of the division's program of fish and game conservation are taken up and freely discussed. Close harmony has been the keynote of the meetings.

Thus far the meetings have been productive of excellent results. It is presumed that they will accomplish much good in coordinating ideas and in tying up of the work of the various bureaus.

Bureau of Patrol

During the three months of August, September and October there were a total of 709 arrests made and fines collected amounted to $24,882. During the same period of last year, 694 arrests brought in fines totaling $27,145.

A number of exceptional cases were made and we are giving a brief summary of some of the important ones here.

As expected the observance of the deer tag law had to be brought rather forcibly to the attention of a number of hunters, who neglected to comply with it.

A Willows man lost his tags and his hunting license and paid a fine of $300 for transferring his deer tags to someone else. Arrest was made by deputies A. D. Miner and L. W. Dinsdale. Venison found in this violator's possession was given to Glenn County hospital patients.

An El Sereto man paid $150 for failing to put tags on deer that he killed. He had eaten the deer when arrested by deputies L. W. Dinsdale and Lee Atkinson. Another fine of $50 was assessed against a Santa Rosa hunter who failed to tag his deer. This arrest was made by the same two deputies.

A citizen of Portugal who declared he was a citizen of the United States, lost fishing, hunting and deer tag licenses and paid a fine of $40 as a result of the wrong information furnished. Deputy Lee Atkinson made the arrest.

Deputy Forrest McDermott, assisted by Volunteer Deputy Alden Moody, worked up a difficult case on a trio of deer hunters, securing fines amounting to $600. One of the hunters paid $150 for killing the doe, while the other two paid $200 and $250 for pursuing the doe. The offense occurred before the season opened and Judge Philip Hayward of Watsonville levied the fines.

Deputies Ed Glidden and Webb Toms, of San Diego County, have good memories and when they brought an offender into court for hunting, killing and possession of deer meat out of season and a plea of "not guilty" was entered and a jury trial demanded, they used this memory.

The offender was found guilty and the judge recommended leniency. Deputies Toms and Glidden asked the judge to postpone the sentence. They looked up the back records and found the deer killer had been arrested and sentenced to a jail term in 1927 for a like offense. The investigation also showed that he had been convicted in July for a violation of the hunting and angling license act. Taking these facts into consideration the judge assessed a fine of $350 or 116 days in jail. The violator was sent to jail.

Another record fell when Deputy Robert J. Little arrested thirty-three violators in the same day at Cabazon, Riverside County, as they were coming out of the Imperial Valley, September 2. All of the parties arrested had more than the daily limit of doves which is fifteen.

Imperial is a great dove country on the opening day and Deputy Little, in order to check the hunters coming out, waited at Cabazon, a sort of port of entry for the valley. He was assisted by volunteer deputies T. G. Elliott, I. O. Burton and J. R. Cory, of Redland.

The thirty-three arrested came from various cities in southern California and all pleaded guilty. As a result, Judge Lee Childers, of Banning, assessed fines of from $25 to $65. In one instance a hunter went to jail in lieu of a fine.

Over 1300 doves were confiscated as a result of the overhauling and fines totaling $900 were collected.

Some protests were made on the ground that as not over the limit was killed each day and as they had hunted two days, they were entitled to two days' limits of birds, but the judge decided otherwise.

Early in September 1929, one John Lucas discovered that game out of season was expensive. Deputy K. K. Langford arrested Lucas with three ducks and one tree squirrel near Baldwin Lake in Big Bear Valley, San Bernardino mountains. Lucas demanded a jury trial. The jury, after hearing the evidence, returned and in less than thirty minutes brought in a verdict of guilty. Judge Lynn of Big Bear Lake assessed a fine of $150 or 75 days on each of the two charges, making the total penalty $300 or 150 days. Lucas went to jail. It is interesting to note that in this locality where game law enforcement in the past has been poorly supported that popular sentiment was in accord with this recent conviction with its rather severe penalty. As a result, better respect for our game laws can be expected in the future.

An Oakland man, who took seventy Pismo clams that were too small to comply with the law, paid a fine of $250 when arrested by Deputy Fred Post of Salinas. Post got his man at Moss Landing and Judge Harry King, of Castroville, levied the fine.

Killing a spike buck on Thomas Mountain in Riverside County cost an Anaheim hunter $300, following his arrest by Volunteer Deputy Willis Connolly and Deputy James Gyger. The offender was fined $500, but Judge Difinia, of Riverside, suspended $200 of the fine. The meat was spoiled and unfit for use, the officers found.

Three hunters of Russian nativity killed a deer on Patterson Mountain in Fresno County. Deputy F. A. Bullard took them into custody when he found they had made false statements in securing their licenses. Each paid a fine of $100 and the deer was given to the Indian School at Dunlap.

Two rather exceptional cases were made recently in Alameda County. Sam Povlsen of San Francisco was stopped by Berkeley police for bad headlights. An inspection of the car disclosed 238 ducks, just 213 more than the limit. Deputy J. L. Bundock was hastily summoned and he placed the offender under arrest. Judge Oliver Youngs, of Berkeley, fined him $500 or six months in the county jail. Being without the $500, Povlsen went to jail.

Charles Mathiesen was arrested by deputies Allen Curry and C. R. Peck and charged with killing a doe. This man is over 80 years of age and the investigation disclosed the allegation that he had been killing deer, does or otherwise whenever he saw fit. He was dubbed the "Deerslayer" in Alameda County where he was apprehended. He admitted his guilt and was ordered to pay $250 or serve fifty days in jail by Judge Jacob Harder, Jr., of Haywards. Mathiesen said he had no money and went to jail.

Three Petaluma duck hunters decided to shoot ducks at 1 a.m. They were arrested by Captain of Patrol Henry Lencioni and Deputy Victor Von Arx, assisted by Ben Foster. Taken into the court of Judge Lester Small, at Sonoma, the three pleaded guilty and were fined $125 each. The fines were paid and the ducks turned over to the county hospital.

Captain Lencioni declared the men were old offenders and had been hunting ducks at night for many years.

Deputy M. F. Joy, of Burlingame, arrested three San Francisco men for shooting nongame birds. They all pleaded guilty in the court of Judge Edward Farrell of South San Francisco and paid fines of $150 each.

Deputy A. W. Sears, of Placerville, arrested a man for killing a doe. Judge E. G. Barrette of Shingle Springs, fined him $150 which he paid and went on his way.

It cost Gust Photopolus, of Madera, a jail term for hunting without a license despite the fact that he gave an assumed name when he was arrested by Deputy H. E. Black, at the Columbia Ranch, Madera County. Taken into the court of Judge LeRoy Bailey, of Madera, a fine of $50 was assessed or the alternative of 25 days in jail. The fine not being paid, the violator was committed to the Madera County jail.

Captain L. T. Ward, of the Sacramento patrol, assisted by Deputy Charles Sibeck, succeeded in breaking up a gang of deer bootleggers operating near Putah Creek, in Yolo County. When arrested

the men had three deer dressed and cut up for the market. They were taken into the court of Judge R. W. Harrison, at Woodland, and charged with the killing and possession of deer meat in closed season and with possession of deer from which the evidence of sex had been removed. Judge Harrison assessed each man $500.

Quail-minded folks who have not the patience of the respect for the law to wait for the opening of the season on this great California game bird, have found it is a costly urge. This came rather forcibly to the notice of K. Yoshia, a native of Japan living in Ventura, when he was arrested by deputies W. H. Claberg and A. L. Pyle, of Ventura County, assisted by Jim Proctor, captain of the volunteer deputies of Ventura County.

Yoshia had two valley quail; the season opens on December 1; this happened in November. He was taken into the court of Judge S. B. Bagnall, of Santa Paula, and the judge accepted a plea of guilty and fined the violator $100.

Captain Walter Welch, in charge of volunteer deputies, has attended various meetings of sportsmen's and other organizations in order to instruct the volunteer deputies in their duties and to advise them as to their status as law enforcement officers and game wardens.

A number of important cases have been made by volunteer deputies. Reports from the captains of county organizations, as well as from the regular patrol force, indicate the volunteers are doing excellent work and have aided greatly in keeping down the violations.

Fine cooperation was secured by regular Deputy R. J. Little from volunteers T. G. Elliott, I. O. Burton and J. R. Dray, of Redlands, when they made a large number of arrests of hunters who had more than the limit of doves in their possession the second day after the season opened.

A letter has recently been sent to all associations and clubs sponsoring the appointments of volunteer deputies, advising that it will be necessary to cancel the appointments of all volunteer deputies who neglect to render the required monthly report. This action was taken to weed out the "dead timber" and uphold the morale of the organization.

Bureau of Fish Culture

Records show that 33,720,245 trout were planted during the season up to the last of October. These fish were allotted to all parts of the state and reports indicate that the plants were very successful.

The fish planted were of the following species: Eastern brook trout, 3,037,588; Loch Leven trout, 5,543,571; rainbow trout, 9,970,300; steelhead trout, 8,235,541; German brown trout, 1,945,500; black spotted trout, 3,014,745; cutthroat trout, 65,000; golden trout, 908,000; large lake trout, 1,000,000. There are 2,650,646 trout of all varieties on hand.

Salmon have been planted in the following amounts: Quinnat salmon, 3,665,300; silver salmon, 1,665,670. Salmon on hand are listed as follows: Quinnat salmon, 898,000; Atlantic salmon, 27,895.

Spawning of brood trout was started at Mt. Shasta hatchery ponds on October 15th. During the last two weeks of the month, 578,000 Loch Leven trout eggs, 190,000 German brown trout and 56,000 eastern brook trout eggs were taken.

All the ponds have been cleaned as the trout have been removed to holding ponds before sorting for ripe and green fish. Eggs taken so far are of good quality and from all appearances the take should be large, at least as large as last season.

General clean-up work has been going on at all of the hatcheries so that they will be in readiness to receive the eggs for hatching. Eggs are being shipped as rapidly as they can be taken to the most accessible hatcheries.

Surveys have been made for a temporary or experimental hatchery in Alpine County. A site has been tentatively selected three miles west of Markleeville. With the Stanislaus, Mokelumne, Carson and Walker rivers having their sources in the Sierra range in this county, it is considered that a hatchery here would be of great advantage in stocking these river systems.

Bureau of Commercial Fisheries

With the sardine canning season well under way, both at Monterey and in southern California, it has been found that, with a few exceptions, conditions in the canning industry have been good. The canners have been endeavoring to cooperate with the bureau, and while some have run into difficulties, in most

instances the required 13½ cases per ton of sardines have been packed.

Additional inspectors were detailed to Monterey immediately after the season started, and it was possible to have a man at the hoist of each plant to check the fish received. An inventory of the cases on hand and a check of the cans received from the can company, made possible a correct count of the fish packed and the system worked out very well.

At the start of the season at Monterey, there was some difficulty regarding weights of buckets after the fish were brought in through the suction hoists, but with the cooperation of Mr. J. S. Casey, the state sealer of weights and measures, a standard was adopted, and, at last reports, weights are satisfactory.

An interesting occurrence at Monterey was the decision of the lampara boat operators not to strike as a protest against the operation of the purse seiners. Instead, most of the lampara fishermen put what they term "half rings" in their nets which make a lampara net a modified purse seine. This plan seems to have solved what for a time appeared to be a difficult situation. It has been found that both lampara fishermen and purse seiners have been fishing too close to shore, and with this modified equipment the lampara boats can fish further out. During the month of September, two purse seine boats and one lampara boat went on the beach near Seaside. The purse seiners were pulled off, but the lampara boat was a total loss.

During the month of October, receipts of sardines at Monterey and Pittsburg were exceptionally heavy, possibly the heaviest for this month in the history of the industry. All of the packers made the required number of cases. The new cannery, the Monterey Fish Products Company, got under way about the middle of the month and packed sixteen cases for each ton of sardines brought in.

Mackerel canning was heavy at San Pedro and San Diego, most of the fish being packed in one-pound tall cans.

The K. Hovden Company, at Monterey, has installed a new suction line for unloading sardine boats.

Three Monterey canners, Sam Xavier, E. B. Gross and Del Mar companies, have installed scales at their plants that have been approved by the Division of Weights and Measures.

Most plants started at San Pedro on November 1, except the Halfhill Company. This company will not attempt to can sardines this season. According to reports the Ventural Cannery at Hueneme started on November 1. The new Newport cannery will not be ready until January.

Receipts of tuna and skipjack at San Pedro were not what was expected during the month of October. The receipts at San Diego have been considerably more to date than last season. The fleet which operated near Turtle Bay in Lower California has had poor catches. The large boats, equipped with ice and operating farther to the south a greater distance from the shore, have made fairly good catches.

Bids have been opened and the contract let for the new patrol boat of the bureau, which will be operated when completed in southern waters, relieving the *Albacore* for duty at Monterey and points north. The new boat has been designed especially for patrol and research work and will be powered with a 200 horsepower Diesel engine. It will be 85 feet long and quarters will provide for research workers as well as the crew. A laboratory will be installed on the new boat.

Hearings were held in Monterey on complaints that three canners had not been complying with orders of the division. Transcripts of the hearings are being considered by the board of commissioners at this time.

The six Santa Barbara fishermen arrested for using a drag net in District 18, were found guilty in the justice court at San Luis Obispo and fines of $125 each assessed against them by Judge William Mallagh.

Bureau of Education and Research

"From Hatchery to Creel" a three-reel feature on trout cultural operations and trout planting in California, was shown at the National Rifle Matches, Camp Perry, Ohio, through the courtesy of the Dupont Powder Company. Major L. W. T. Waller, Jr., was so impressed with the picture that he requested permission to reproduce the feature in the 16mm size and have it displayed by Dupont representatives throughout the United States

as an example of some of the most advanced work in trout production.

News reels suitable for showing over the motion picture circuit have been made up by photographer E. S. Cheney. The first of this new series called "Naturelogues" shows duck hunting before and during the opening day of the duck season. Another presented some of the thrills involved in catching striped bass. The picture was made during outings of the Berkeley Rod and Gun Club and the Oakland Striped Bass Club at Napa Slough and Mallard. It has been received with great interest by sportsmen.

Attempts to give a story element to a film depicting activities of the division have at last produced "A Camp in the Woods." The picture presents the many interesting phases of the efforts being made to restore and protect wild life as related by a deputy to some sportsmen.

A number of special lectures have been given by Dr. H. C. Bryant before the principal schools in Los Angeles and Los Angeles County. During December, the chief of the bureau attended a conference of the park naturalists of national parks. Opportunities to stress fish and game conservation in western national parks was emphasized.

A news reel "The Shad of California" was the means of bringing about a splendid educational program presented to the school children of Pittsburg. The picture was made in the Pittsburg cannery and residents had an opportunity to see themselves or their friends at work in the picture during the evening presentation. R. S. Ellsworth, S. H. Dado and Captain H. B. Nidever represented the division.

Half-hour broadcasts were given each Wednesday during October, November and most of December over KRE, a Berkeley radio station. All members of the educational staff participated. Captains Walter Welch, M. S. Clark, Walter Sellmer and his wife made important contributions to the prorgam. W. I. Follett and Paul Bonnot of the Commercial Fisheries Bureau were other featured speakers.

Analysis of a large number of soil samples have been made by Paul A. Shaw. Data on these soil and water samples are being compiled into tables and graphs for future studies.

FIG. 29. Exhibit of a brood of wild turkeys with their domestic mother. Photo by E. S. Cheney, May, 1929.

An outbreak of the duck disease occurred at Tule Lake, Modoc County. It was in progress for about two weeks and reached its peak on September 7. The area involved was small and the total number of deaths reported not very great. Buena Vista Lake is entirely dry and the lake bottom has been plowed up for cultivation. As yet no sick ducks are reported for the Hollywood Gun Club area. The duck disease outbreak at Salton Sea on investigation proved greatly exaggerated.

Bureau of Finance

During the months of August, September and October total sales of the three offices were $222,769.19. This included probably the final sale of deer tags and while the final reports of the period have not been completed, it is almost certain that the total for hunting, angling and deer tag licenses will exceed that for 1928.

Bureau of Game Refuges

During the months of August, September and October, fifty mountain lions were reported killed. Of these, twelve were killed in August, seventeen in September and twenty-one in October. This makes the kill for the ten months of 1929, 272, which is just two less than the same period in 1928.

A. D. McLellan has finished posting refuges in the northeastern part of the state. For the past two months, he has been busy developing the Los Banos duck refuge, the new 3000-acre tract purchased by the state as the first step in the development of a system of duck refuges throughout California.

Bureau of Publicity

An average of twenty-two stories a month are prepared for newspapers through regular release channels of the

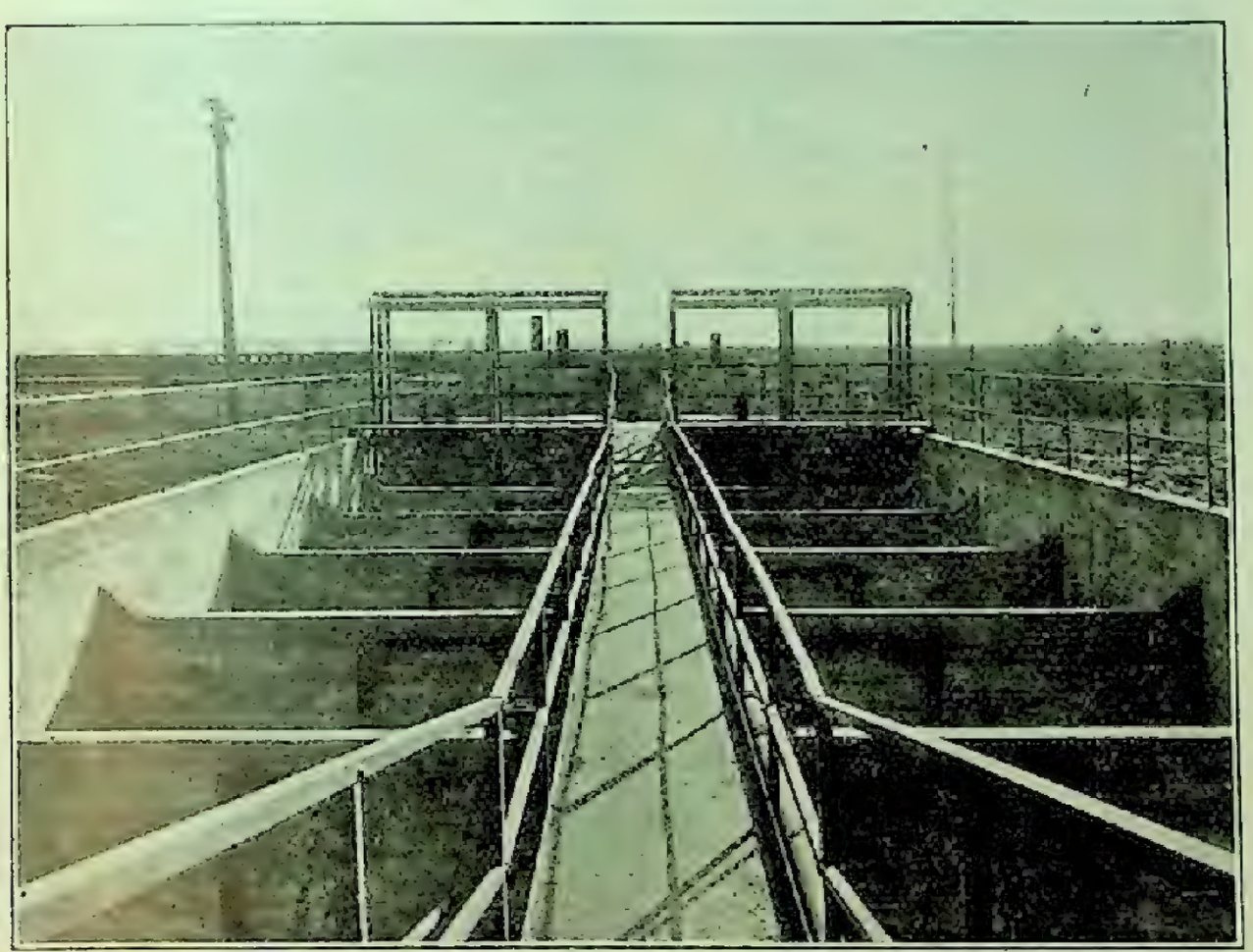

FIG. 30. Another step toward pollution prevention. Separator pit used in reclaiming system to extract oil from water at Los Angeles refinery of Texas Company of California, Wilmington, California. Photograph November 1, 1929, courtesy of Texas Company of California.

bureau. Each month special feature articles have been written regarding activities of that particular month. These are placed in the most advantageous publications.

Recently an article on the rescue of striped bass near Tracy and their planting in the Salton Sea in Imperial County was sent to *Touring Topics*, official organ of the Automobile Club of Southern California. This article was well illustrated with photographs made by E. S. Cheney and a photographer in El Centro.

Other features have appeared on the work of the commercial fisheries bureau, as well as the fishing and canning industry at Monterey.

Daily contacts are maintained with San Francisco and Oakland papers and excellent results are being obtained with division publicity.

Among other things, a Service Bulletin is issued monthly as a house organ for employees of the division.

Bureau of Hydraulics

The bureau has made numerous inspections of fish screens, fish ladders and investigated the need for the same at various places. Inspections have been made where pollution has been reported.

A total of forty-five new surveys have been made and plans prepared in each case, these are for fish ladders and fish screens at points where they are either needed or in need of repair.

An opening has been made in the Henry Dam on Carson River near Markleeville, Mono County, to avoid the installation of a fish ladder.

The Pacific Gas and Electric Company has installed a fishway on its intake dam on the South Fork of the American River above Placerville.

The case of the *People* vs. *The Cain Irrigation Company* was tried before a jury in the justice court at Bridgeport, Mono County. The Commission had ordered the installation of fish ladders which order had not been executed. The defendant concern was found guilty. An appeal has been taken by the company. This is an important case as it is the first such victory won by the division in this section of the state.

Inspections of the southern California oil fields show that an earnest effort is being made by companies operating there to cooperate with the division in its program of pollution prevention.

Bureau of Game Farms

An important event was the dedication of the new Los Serranos Game Farm in southern California. With appropriate ceremonies in which fish and game and other state officials participated, and with the excellent cooperation of Izaak Walton clubs and other sportsmen's organizations, the new farm near Chino was officially given headway.

Long before the opening, birds were on hand, and the farm was practically in operation before the date set. The farm has a fine population of ornamental and game birds and everything indicates that it will function in a highly efficient manner.

During October three refuges, two for pheasants and one for turkeys, were established. The pheasant refuges are located in San Luis Obispo and Contra Costa counties, while the turkey refuge is located east of Bakersfield, Kern County, in the Breckenridge reserve.

Further developments in the brooder system at the Yountville Game Farm have taken place with the introduction of "heating strips" that furnish positive heat and do not burn out. Information leading to this installation was secured from the Southern California Edison Company, through its heating department. Current flow is controlled by a Mercoid thermostat and the brooder is easily controlled after the thermostat is set for any particular degree of temperature.

October is the month for picking and sorting of breeding stock for the coming year. An extra number of Chinese ring-necked pheasant stock in order to supply the rapidly increasing demand for hatching eggs, will be kept on hand. These requests come from clubs, individuals and organizations interested in propagation work.

COMMERCIAL FISHERY NOTES

N. B. Scofield, Editor

SCARCITY OF SMALL SARDINES

For many years the catching of several of our most important commercial fishes has depended on the abundance of small-sized sardines to be used as bait. In these certain fisheries there are several possible means of capture but live bait fishing has been found to be the surest and most satisfactory method of capture in commercial quantities.

Small-sized sardines are almost universally used for live bait in this state and an abundant supply is a matter of great importance as it affects directly the catch of so many other species. Very little of the bait catch is delivered ashore since most of it is taken by each fishing crew for its own immediate use and because these individual catches are small we are apt to overlook the fact that the sum total of the numerous catches is very great. At San Diego, for instance, we have estimated that the catch of small sardines for use as bait exceeds the catch of small sizes for canning in the quarter-pound tins.

At San Diego the question of bait is of special importance because the canneries at that port depend chiefly on the several species of tuna, and the tuna fishing, both local and off the coast of Lower California, depends largely on sardines for live bait. The supply of small-sized sardines suitable for bait has apparently been decreasing in the neighborhood of San Diego. Judging from observations in this region, it would seem that each year there is increasing difficulty in obtaining sufficient quantities of sardine bait.

In the San Pedro region, we hear an increasing number of complaints as to scarcity of bait. Particularly during the summer and fall of 1929, it was claimed that bait was so scarce that the fishing for the local run of skipjack was seriously handicapped. Reputable fishermen claimed that skipjack were plentiful and were biting well, but that the small catches made by the boats were due to the insufficient quantities of bait. Years ago, it is claimed, there was little difficulty in finding as much bait as was needed but during 1929, hours of searching and repeated hauls yielded only a few scoopfuls of small sardines.

Of course the reports of fishermen are not absolute proof, but in this case it seems certain from such reports and from our own observations that bait is very scarce and probably much less abundant than in past years. It is a fact that there has been an increased demand for bait during the last few years and this in itself might lead fishermen to complain of increasing scarcity if they experienced difficulties in obtaining bait. It is also possible that changing oceanic conditions have caused a scarcity of small sardines in the bait fishing localities. However, it seems more probable that the heavy fishing for sardines in the restricted areas has caused an actual shortage in the local supply of small sizes. If the shortage is anything more than strictly local, the situation may be very serious, not only for the fisheries depending on the live bait but possibly also for the sardine canning industry. A general scarcity of small sardines at present would result in a shortage of the sizes suitable for canning during the next six or seven years.—W. L. Scofield, California State Fisheries Laboratory, November 11, 1929.

PISMO CLAM CENSUS

The 1919 census of clams, *Tivela stultorum*, on Pismo Beach was made by the California State Fisheries Laboratory on November 16 to 18. As in former years, three standard trenches, approximately six inches wide and eight inches deep, were due across the intertidal zone and all clams found recorded according to size and age.

The outstanding feature of the 1929 census was the discovery of a heavy set of young clams. Clams spawned in 1929 were numerous along the entire beach and far outnumbered all older individuals. Previous to this year, no heavy set of clams had occurred since 1924. The 1929 set, however, exceeded that of 1924 by about one-third. Since the Division of Fish and Game has been making an annual census of the Pismo clams heavy sets have been recorded for 1919, 1924 and 1929. The establishment of a closed area in July, 1929, should assure the protection, at least on a certain portion of Pismo Beach, of the 1929 set. This year class will thus be spared the fate of the abundant 1924 class which due to the persistent activities of clam diggers, was practically eliminated from the

intertidal zone before the clams reached legal size.

The presence of many young clams on the beach, however, must not be allowed to mask the paucity of older individuals, for with the exception of clams from the 1929 spawning, this year's census showed a decrease in the total number of clams of all ages. This decrease was most marked on the beach where digging is still allowed and slightly less evident in the closed area. Because of this decrease in the number of older individuals, the future abundance of the clams on Pismo Beach will depend on the adequate protection of the numerous 1929 year class.—FRANCES N. CLARK, California State Fisheries Laboratory, Nov. 1929.

ALBACORE OFF OREGON AND WASHINGTON COASTS

Hubbs and Schultz, in an article in CALIFORNIA FISH AND GAME (Vol. 15, No. 4, 1929 p. 237) state that, to their knowledge, albacore were caught for the first time off the Oregon coast in August, 1926, by two salmon trollers, fishing between Coos Bay and the mouth of the Suislaw. Before that, the farthest north albacore had been recorded was off the coast of northern California.

On October 19, the halibut boats *Hoover* and *Wireless*, landing halibut fares at Seattle, reported seeing large schools of albacore (*Germo alalunga*) off the Oregon and Washington coasts. Captain John Christensen, of the *Wireless*, fishing 32 miles off Columbia River Lightship, brought in four large albacore, one of the fish measuring 81 cm. in length. Captain Olvang of the *Hoover*, fishing 25 miles off Heceta Head, caught one albacore. According to Captain Olvang, this is not the first time albacore have been seen in these waters. For the last four seasons, during the fall months, and especially in October, he has noticed albacore on Heceta Bank, although this year the schools of fish were most numerous. The four albacore were caught during the course of the regular halibut fishing, using the set line or trawl type of gear.

Captain Baggan, of the *Presho*, also mentioned catching what he thought to be albacore, off Destruction Island, about 40 miles to the southward of Cape Flattery.

On October 31, 600 pounds of albacore, the largest amount of this fish yet to be landed at Seattle, was brought in by the *Neptune*, Howard Giske, captain. The fish were caught off the Oregon coast, between Cape Blanco and Yaquina Head. Four or five albacore were landed the following day by the *Wireless*, fishing approximately the same ground as on the previous trip, off the Columbia River.

In view of the information supplied by the halibut skippers the occurrence of albacore off the Oregon and Washington coasts may not be so unusual as previously supposed, or so characteristic of any one season or seasons.—ERNEST PEGLER, International Fisheries Com., University of Washington, Seattle Washington.

HOW ABALONES ARE SOMETIMES PLANTED

The bulk of the fresh abalone that is eaten by Californians comes from Monterey. During the past few years, over 2,000,000 pounds of this delicious mollusk meat, have annually left the Monterey markets. To help supply this demand, eight abalone boats deliver to four of the markets at Monterey that are equipped to handle abalone. During the abalone season, which lasts from March 16 to January 15, one of these boats will bring in from 60 to 250 dozen market-size abalones each trip. As high as 1,600 dozen have been unloaded by these eight boats in a day.

Early in the morning of November 5, 1929, the Japanese abalone boat, *Nagato*, carrying a crew of five men (including two divers), was coming in to deliver its capacity load of 250 dozen abalones to the A. Paladini Company. It had successfully made the run up the coast from below Point Lobos, and was well within Monterey Bay when the boat ran into a heavy fog. The fog confused the pilot of the *Nagato*, who failed to allow enough clearance for China (Mussel) Point, on which the Hopkins Marine Station of the Stanford University is located. The boat hit the rocks of the Point and turned over on its side, throwing men, equipment, and abalones into the water. Luckily, another abalone boat had been running alongside farther out, and so the *Nagato* crew swam to the other boat. As the law specifies that abalones must be brought to shore in the shell and in a live condition, and as the wreck occurred in a district closed to diving, the result was a plant of 250 dozen market-size abalones on the rocks of China Point.

The Division of Fish and Game of California has found that specifying an eight-inch lower limit on the sizes of the abalones taken by the market fishermen, will not deplete the supply to any extent, for at this time the abalone has spawned

several times and is past the peak of productive spawning, so that the weeding out at this size may be really beneficial on the whole.

The abalones landed at the Monterey markets are obtained entirely by diving in District 18 (which extends from the mouth of the Carmel River to the southern boundary of Santa Barbara County). The diving must be done in twenty or more feet of water as the law specifies that no abalones may be sold that are taken between high water mark and twenty feet below extreme low tide in Districts 7, 10, and 18. This insures a permanent supply for the sportsman, whose activities are naturally confined to wading at low tide.—J. B. PHILLIPS, California State Fisheries Laboratory, November 30, 1929.

SARDINE BOAT LOST

Low fog, whether on land or sea, is a menace to travel. The well-known purse seine boat *Mabel*, which had been delivering sardines to the San Pedro canneries for the last ten years and to the Monterey canneries since the start of the 1929–1930 season, was a victim of fog.

On the night of November 9th, the *Mabel* was cruising around in the fog, looking for sardines, between Point Ano Nuevo and Pigeon Point, when she suddenly hit some outlying rocks. Captain J. Bernsten and his crew of nine men remained on the wrecked boat for six hours before they were able to make an escape. Their skiff having been cast adrift at the time of the wreck, the crew ingeniously used the turntable on which the purse net is piled, to effect their escape, drifting to shore with the incoming tide.

The *Mabel* was 67 feet long, 15½-foot beam, and carried a 90-horsepower Atlas-Imperial engine. At the time of the wreck it was valued at $12,000. It was covered by insurance to the extent of $8,000, which did not include the purse net, valued at $2,500.—J. B. PHILLIPS, California State Fisheries Laboratory, December 2, 1929.

UNUSUAL FISH AT SAN PEDRO, CALIFORNIA

During the late summer and fall a number of fish unusual to the commercial catch of San Pedro was landed at the markets and canneries.

The first of these was a large mackerel-like fish, *Acanthocybium*, known as the wahoo. It was five feet long and very slender, weighing under forty pounds. A brief description is as follows: color, bluish above becoming silver on the belly; mouth beak-shaped and the upper jaw hinged; dorsal fin of 24 spines and nine soft rays followed by ten finlets similar to those of a tuna; anal fin of one spine and eight soft rays followed by nine finlets; large median keel and two smaller ones on each side of the caudal peduncle. This fish was brought in early in August, 1929, by a tuna boat from the west coast of Lower California. Towards the end of September, a tender-boat brought in another, somewhat smaller, from the tuna fleet fishing in the same locality.

About the middle of August a former salmon fisherman from Fort Bragg caught a chinook salmon, *Oncorhynchus tschawytscha*, not far from San Pedro. This fish which weighed about seven pounds was delivered to the fresh fish markets.

On the 14th of October, a mackerel boat fishing for the canneries brought in a shad, *Alosa sapidissima*, 42 cm. long. Exactly a month later another shad, 53 cm. long, was landed at the fresh fish market by a small boat that had been fishing off Seal Beach.

A few days after the first shad was brought in, another mackerel boat caught a surf perch, uncommon in southern California. This perch, *Phanerodon atripes*, was 23 cm. long.

The next week, a boat fishing for a cannery had in its load of mackerel a specimen of *Synodus lucioceps*, the lizard fish, 41 cm. in length. It bore a remarkable resemblance to a lizard with its scaled flattened head and long slender body. Its large mouth was armed with numerous long needle-sharp teeth, some of which were hinged. The presence of an adipose or fleshy dorsal fin is a characteristic of the fish.—RICHARD S. CROKER, California State Fisheries Laboratory, November, 1929.

DEPLETION OF SOUTHERN HALIBUT PROBABLE

Preliminary work on a boat catch analysis of the southern halibut from the Los Angeles and Orange County districts shows a sharp decline in the landings of this species of fish. The work is based on the assumption that the only true means of determining the status of a fishery is to measure the catch by the unit of effort expended. In the development of these studies, many refinements of the first simple methods have done much to eliminate inaccuracies. However, in almost all the results obtained from these methods the catch per boat decreases from 40 to 50 per cent in the 11-year period, 1919–1929.

A report on the southern halibut investigation will be published as a Fish Bulletin just as soon as this work is completed.—G. HOUGHTON CLARK, California State Fisheries Laboratory.

JAPAN STUDIES FISH BOAT TYPES

The Imperial Fisheries Institute of Tokyo, Japan, in the March, 1929, issues of its official journal, published findings resulting from a technological study of the types of boats now in use in the bonito and "tegurami" fisheries of the Japanese insular chain. It seems that a multitude of vessel sorts are in use in the different fishing ports, and it was to discover the actual, intrinsic qualities of each that the experiments were undertaken.

Representative craft were selected; these were reproduced in model form, and the miniatures towed by a sensitive recording mechanism through a tank of still water. The data resulting from the tests show that whereas boats of European design attain a higher speed than do native types of identical engine power, the Japanese square-framed boats make better headway than do the European, when low-powered. Since some of the Japanese fishing craft still navigate under sail, and many have recourse to hand-propulsion by oars, or by the long, arched stern-sweep characteristic of all Oriental ports, the reason for the persistence of the junk-type fish boats is evident.

In addition to the ease with which the native craft can be moved through the water at low speeds, the investigators found that the square-frame sorts possessed greater stability than do round bottoms, the knuckles or chines having the same effect as rolling chocks or bilge keels. This is another element of much consequence, especially in the smaller boats, for "stiffness" is a chief contributor to the ease with which men may work on deck.—GEO. ROGER CHUTE, California State Fisheries Laboratory, August, 1929.

LIFE HISTORY NOTES

GROUSE RESPOND TO PROTECTION

The intelligence of animals is often strikingly presented in their ready response to kindness and protection on the part of man. The Wallmick summer resort at the Jordan Hot Springs, Tulare County, California, has offered protection to a female Sierra grouse (*Dendragapus obscurus sierrae*) and its operators with the liberal aid of nature are actually aiding grouse production.

A report from Deputy Ray J. Bullard states that the bird is in the habit of appearing in the spring with a brood shortly after the Wallmicks commence operations. This has been a regular event during the past seven years, the mother rearing her family within the shadow of the resort. Food is supplied the birds twice daily and the Wallmick child considers them her special pets. Occasionally the mother conducts her tiny flock into the adjacent woods. When night comes they can always be found roosting in a large cedar back of the store. By the latter part of October when the resort is closed the young birds are able to shift for themselves and return to the wild. The old bird, however, has so far always put in her appearance with a new brood with the opening up of the resort.—RODNEY S. ELLSWORTH, San Francisco, California.

FIG. 31. Sierra grouse and brood of almost full-grown young, Wallmick summer resort, Jordan Hot Springs, Tulare County, California. Cross indicates mother bird. Photo by Ray J. Bullard, summer, 1929.

DESERT MOUNTAIN SHEEP OF THE INYO MOUNTAINS

On October 4, 1929, Mr. E. S. Cheney and I arrived at our base camp east of Big Pine, Inyo County, California. There are several large springs along the western edge of the sheep range flowing out from the base of a spur of the Inyo mountains.

A large desert bighorn ram was drinking at one of the springs when we arrived, so we waited for him to depart up the mountain before putting up a blind. We placed the blind about 90 feet from the spring from which the ram was drinking. It was at this same spring that Mr.

Cheney made photographs of mountain sheep two years previously. We remained in the blind for the rest of the day, but saw no sheep.

The following day, shortly after rising in the early morning, we saw a ram on the skyline above the spring and about half way up the slope of the mountain. He was working upward and finally disappeared over the ridge.

lambs. It looked like there were six of each, but it was so far away that I could not be certain.

At 10.30 a.m. I saw four rams together under some pinyon pines near the main summit and a few minutes later I picked up a big black ram. This may have been the same one Mr. Cheney photographed two years previously. He was all alone on the ridge and appeared extremely

FIG. 32. Average sized desert mountain sheep ram, Inyo Range, Inyo County, California. Enlargements from moving pictures by E. S. Cheney, October, 1929.

Mr. Cheney entered the blind and I went out on the flat to scan the mountains with twelve-power binoculars. I soon spotted the ram we had seen earlier, still climbing up the ridge. After watching him for several hundred feet, I observed that he came to another ram which I had not previously seen and they both proceeded up toward the pinyon pines of the main ridge. A few minutes later I located a lone ram and another above him, high up on the main ridge and fully 2500 feet above me and more than a mile away.

The first two picked out a shaded spot under a pinyon pine and finally laid down.

Farther south along the range I located twelve animals, apparently all ewes and large with very heavy horns. At 11.30 a.m. practically all the animals under observation laid down. Most of them found shade under pinyon pines but some picked out more exposed situations, especially the rams. They remained at rest until about 1.45 p.m. I located the white rumps of three more rams about 2 p.m. and a little later I saw two more on the skyline at the main summit.

As I was returning shortly after sundown, I saw two rams I had not seen previously standing on pinnacles to get the last rays of the sun and one last view of the valley below. As I came back I noted that five of the rams were located on the tops of crags, pinnacles and exposed situations.

The ewes do not seem to spend as much time gazing about as do the rams, consequently the ewes are much harder to locate against the grayish brown background of rocks and soil. At best a desert bighorn is extremely difficult to see unless it is rear end to or moving along rather rapidly. In feeding, the white rear part of the animal is generally on the downhill side whether the general trend of progress is up or down the mountain slope. These twenty-eight sheep were all seen in about three miles of mountain range.

FIG. 33. Young ram, three ewes and a small ram drinking at a spring, Inyo County, California. Enlargements from moving pictures by E. S. Cheney, October, 1929.

On October 6, Mr. Cheney went to the picture blind while I used the observation blind on a nearby rocky knoll. I spotted the large black ram high on the slope of the main ridge and a little later watched him pursue a ewe around the sidehill.

Another ram was noted working down the mountain as though coming to water. I lost sight of him, however, and watched the ram chasing the ewe. All of a sudden, at 10.30 a.m., in front of me there was a tremendous rattling of rocks. There was the ram I had seen coming down! He was only a few feet from a smaller spring which was strongly sulphurous. He stopped, gazed about for sometime, trotted down to the water and looked about some more. He seemed to sense that something was amiss with my rock pile but could not determine what it was. He gazed intently at the aperture where my kodak was inserted but finally began to drink and I began snapping pictures. He was medium in color and carried a fine set of horns for a relatively young animal. One horn was practically perfect but the left one was frayed and worn a little at the tip. The horns spread, I should say, about 20 inches and were from 15 to 16 inches in circumference at the base. I was only about 80 feet distant from him.

He drank about 40 seconds and gazed about; then drank 65 seconds and turned to look straight at my blind; 53 seconds the next, and 46 the last time. He stood a few moments and shook himself, then returned to the same ridge which he had come down about 600 yards south of the spring.

At 1.30 p.m. I noticed some sheep coming toward the spring from the same direction in which the ram had disappeared. At first I was unable to determine their number. They were coming

directly toward me and I was unable to count the white rumps. As they were approaching, I heard a tremendous noise of rolling rocks and pebbles high up on the main ridge. I turned the glass toward the sound and here came the big black ram leaping and bounding down the mountain from about 2000 feet higher up. He had seen the band of ewes approaching and was coming down at a tremendous pace. How any animal could descend over such country, so rapidly without a misstep is more than I can conceive.

There were two other large rams with the bunch, one young ram and fourteen ewes. They arrived finally and all drank from the sulphur spring except one young ewe and one ram which went to the spring near Mr. Cheney's blind. The black ram did not drink.

One ewe called to another in a very deep tone, not unlike a single note of the eastern bullfrog. It sounded like "baw" given in a deep guttural bass with a slight gurgling of the note and sustained for two seconds. A ram called to a ewe in the same tone quality and pitch but with no vibration or gurgling.

The dark ram was rather oddly colored, being solid black on the breast, dark sides with a grayish cast, white-tipped nose and light amber colored horns. He was more bulky than any of the others. I would judge his horns to be between 17 and 18 inches in circumference.

All of the sheep returned by the same route they used in coming. There were no lambs with them, but when they came to a canyon farther along the range, I discovered five lambs left behind with four other ewes.

This seems to corroborate the observations of others that the lambs do not always come to water with the ewes. Mr. Cheney saw one lamb come with the ewes on his previous visit, but it did not drink, spending the time while the others were drinking playing about over the rocks nearby. The ewes apparently come to water about once every seven days, whereas the rams come every two to four days. During the rutting season, the rams are likely to chase the ewes until they become thirsty and have to come to water more frequently. Normally the rams come from 9.30 to 11.30 in the morning and the ewes from 1.30 to 3.30 in the afternoon, but during the rutting season they may come at any time.

Mountain sheep seem to feed on everything in their range that could possibly be eaten. I saw some even picking at the tips of pinyon pine branches. Bunch grass seems to be the staple food, however, along with the mahogany.

Since Mr. Cheney could only find thirteen sheep two years ago on the same range and there are now at least twenty-eight, and according to men living in the vicinity from thirty to forty-five head, it would appear that the range is desirable and that the sheep may be on the increase.—D. D. McLean, San Francisco, California.

ELK THRIVING IN SHASTA COUNTY

Forest Ranger William Spargo at Winthrop, Squaw Creek, reports at least 500 elk in this district at present. He says they are somewhat scattered, some ranging as far south as Grizzly Peak and some as far north as McCloud Flats. Forty head are also reported in one herd fifteen miles south of the Pit River. There are more calves this year than ever before and the animals are reported to be in good shape. Mr. Spargo insists that this estimate is very conservative, though it is based on the signs as well as the elk he actually saw last winter after all stock had been taken out.—Charles R. Love, Redding, California.

SEVERE WINTER THREATENS PLUMAS COUNTY DEER

We have been having such light winters in the Quincy section that the deer seem to take it for granted that we will never have any more hard winters. As a rule, in the first indication of storm the deer start to move for lower country. The last six or seven years, however, they have all stayed in and if we ever get a big snowfall all at once the state will suffer a tremendous loss of deer from starvation.

Legal protection and a more wholesome attitude toward the fish and game laws have increased the number of deer. It is nothing unusual to count a hundred or so in areas where ten years ago deer were quite uncommon. Protection and control of forest fires has increased cover and given a good food supply. As a result deer do not need to make migrations of considerable extent in order to find food. I am afraid the deer have become so accustomed to staying in certain parts of the high country that some of these winters we will call on every possible means to save even a small per cent of the deer we now have in Plumas County.—C. J. Barnes, Quincy California.

FEMALE DEER HAS ANTLERS

A deer hunting license tag No. 85518 discloses that P. B. Pugh, of Tipton,

Tulare County, California, killed a mule deer at 7 a.m. on October 13 in Big Meadows. The animal was a female, yet possessed symmetrical antlers having about an eleven-inch spread. The antlers were perfectly forked on both sides. Additional information secured from the hunter shows that the deer had every appearance of a buck to the hunter. It was the same color as bucks in the region in October. Its hoofs on close examination were those of a buck. When dressed the animal weighed ninety-three pounds.—RODNEY S. ELLSWORTH, San Francisco, California.

FIG. 34. Osprey nest at Salt Springs Reservoir, Milton, Calaveras County, California. Frank Daniels accords the birds protection and has placed a sign to warn others not to disturb them.

CONSERVATION IN OTHER STATES

SCIENCE AIDS CONSERVATION IN WISCONSIN

Six projects of scientific research are being conducted in Wisconsin this year in problems of state conservation, and in several of the projects members of the University of Wisconsin staff are conducting the work. The research bureau of the Wisconsin Conservation Commission, which is fostering the projects, is made up of scientific men who are cooperating with the commission. By a study of soil and forest and forest cover in northern Wisconsin, the commission will be able to estimate how much future forests will be worth. This survey is under direction of John Bordner as a cooperative venture with the State Department of Agriculture. Growth of trees, a game survey and charting of many lakes which have hitherto not appeared on maps, are also subjects of the survey. Dr. E. A. Birge and Professor Chancey Juday are continuing their study of fish foods and lake life, with headquarters at Trout Lake, Vilas County. The data which they are collecting will aid in developing a more exact method of propagating and planting fish. Dr. A. O. Gross, Brunswick, Maine, is conducting an investigation of such game birds as prairie chicken in the state, through laboratory and field studies. Growth and welfare of vegetation in seined and unseined areas of lakes at Madison, with species reference to lake bottom vegetation where carp is seined, are being studied by men from the Department of Botany of the university. Size of mesh, length of nets, methods of dragging and lifting nets and results of seining at various times of the year are being observed in another study, in an attempt to improve methods of eradicating carp.—*Science*, Vol. 70, No. 1806, Aug. 9, 1929.

PENNSYLVANIA STUDIES DEER

According to a news bulletin of the Pennsylvania Board of Game Commissioners perhaps nowhere else is a research program concerning any single species being carried on nearly as extensively as the white-tailed deer study. A cooperative deer study investigation committee was appointed in March. One of the most important single programs being carried on by the committee at present is the study of nutrition. These experiments are being conducted at State College and the ultimate aim is to determine the nutritional value of hemlock, laurel and rhododendron browse for the white-tailed deer. At least from 30 to 50 fawns have been placed in a quarantined lot near the college for observation and these creatures will gradually be weaned from milk to hay and silage. During this period observations will be made of their preference for available feeds. At the same time all deer showing signs of parasites will be separated from the others and used to study methods of eliminating parasites on their general condition. Following this course of study the creatures as they become older will be grouped and placed in separate feed lots. At intervals after the animals have been placed in separate areas they will be weighed. Groups will be fed laurel, rhododendron and hemlock respectively. It is hoped to glean every possible information concerning the food value of the above mentioned browse before the study is finally completed. In addition to the studies carried on at State College, officials have prepared a program of intensive general field study of the deer in their natural environment.

MICHIGAN STUDIES DUCK FOODS

The Conservation Department of Michigan has employed scientists to study plants preferred by waterfowl for food. The data secured are to be the basis for stocking lakes and marshes with food plants for all important species of ducks. The study is a continuation of investigations commenced a year ago. It is expected that the list of plants secured before the end of the season and the information secured as the result of their compilation will prove of value to the entire country.

WILL CODIFY GAME LAWS

The state legislature of Massachusetts at its last session created a commission to revise and simplify the state fish and game laws. The commission will be made up of one senator, two representatives, the president of the state fish and game association, a representative of the state attorney general's office and a representative of the state division of fisheries and game.

The commission has been holding sessions in various parts of the state to obtain local sentiment and accurate information and its report will take the form of a bill to be introduced in the next session. It has been found in a number of states that this method of revision and codifying the state laws is more apt to meet with legislative approval than any act which might be suggested by a voluntary committee or organization, no matter how well qualified it may be. The fish and game laws of every state in the course of time become involved, contradictory and ambiguous owing to numerous petty amendments adopted at each legislative session. It is necessary to clear the records occasionally by complete recodification.

MINNESOTA AND WISCONSIN COOPERATE

During the last legislative sessions, Minnesota and Wisconsin established uniform regulations for their interstate waters for hunting and fishing. The two states also agreed to have uniform seasons where conditions affecting game and fish are the same.

Plans are on foot to have Michigan join in the cooperative work. With the three states harmoniously regulating wild life resources, more effective administration is bound to result.

PHEASANT PROPAGATION IN TWO STATES

Michigan and Wisconsin produced at their game farms this year a total of 30,000 pheasant eggs. Each state set as large a percentage of the eggs as possible at the state game farms and distributed the others to prviate individuals for hatching. The distribution of birds from the two states will approximate 15,000, besides those reared by private individuals.

The hatching of eggs by individuals has not been as successful as the work of the state game farms, owing to lack of technical knowledge and experience.

The work of these two states in propagating and introducing pheasants is of a substantial character and should go a long way toward increasing the stock of wild birds.

ARKANSAS BUILDS MAMMOTH FISH HATCHERY

According to announcement of the Arkansas Game and Fish Commission, that state is now constructing what, when completed, will be the world's largest fish hatchery. It is being constructed near Lonoke, Arkansas, under the supervision of Del Brown, of the U. S. Bureau of Fisheries, an experienced fish hatchery builder and superintendent who has been loaned to the state of Arkansas for this undertaking. Mr. Brown is officially in charge of the U. S. fisheries station at Mammoth Springs, Arkansas.

The Arkansas hatchery, when completed, will include 244 acres of ponds and will be devoted to the propagation of the warm water nest building fishes such as bass and bream.

MICHIGAN REQUIRES PERMIT FOR INTRODUCED SPECIES

The importation into Michigan of game birds, game and fur-bearing animals, now requires a permit from the Department of Conservation. During recent years rabbits from Kansas, coyotes from Ontario, pheasants from Wisconsin, Illinois and Pennsylvania, quail from Mexico and California, partridge from Europe, muskrats from Louisiana and Maryland, elk from Wyoming, reindeer from Lapland, and nobody knows what else have been brought into and turned loose in Michigan without hindrance. But under the new game law such introductions can now be made only under permits obtained from the director of conservation. There is no charge or fee for these permits. With the new law in effect birds or animals imported without permit are subject to confiscation and the individuals responsible for the introductions are subject to fines. The Department of Conservation emphasizes that there is no intention to interfere with reasonable importations and the experiments, but it hopes to avoid the introduction of serious pests and to prevent the spread of new wild animal diseases into Michigan.—*American Field*, vol. 112, no. 46, November, 1929, p. 500.

ANTELOPE SEASON IN WYOMING

The Wyoming State Game Commission again made provision for an open shooting season on antelope for last fall for a period of three days in part of the state and six days in other portions commencing September 20. The special antelope permits cost nonresidents of the state $50 each and each hunter or party of two must be accompanied by a guide.

COLORADO OPENS SEASON ON ELK

Colorado has nineteen game refuges embracing a total of 3,324,480 acres. According to a report of the Colorado State Game and Fish Commission most

of these refuges have proved effective in protecting elk. The animals have become so bold as to leave the refuges, ravaging adjacent farming areas. In order to check the activities of the worst marauders and thin out some of the old bulls, an open season on elk for three days in November was allowed.

WASHINGTON PROTECTS FAMOUS STEELHEAD

A most important clause in the new law makes it a crime for a hunter to fail to properly dress, care for and utilize his kill within twenty-four hours. The offense is punishable by a fine of from $250 to $1,000, or a jail sentence of not more than one year, or both. The law further provides that to kill any game bird, animal or fish and needlessly to allow it to waste is a misdemeanor.

The famous steelhead trout of the west coast was put on the game fish list, and its sale prohibted.—*Outdoor America*, November, 1929, p. 63.

MICHIGAN HAS GOOD PHEASANT HATCH

Reports from the Game Division of the Michigan Department of Conservation show that nearly twice as many pheasants were produced this season as were ever before propagated at the state game farms. A total of over 19,500 eggs were set and the hatch amounted to over 13,800 chicks.

A low average of returns was reported on the 7600 eggs distributed to private individuals for hatching, rearing and release. Consideration is being given, because of this, to the development of local rearing pheasant stations by reputable clubs and conservation organizations.

MOOSE IN NEW ZEALAND

North American moose were liberated in the wild fiord country on the southwest coast of South Island nineteen years ago. The animals have increased and are now considered thoroughly established. Hunters entering the country have observed them, but it was not until this season that a settler, E. J. Herrick, of Hawkes Bay, North Island, secured a license to kill moose. After traversing country where it is doubtful white men have ever been, Herrick secured the first head of a moose shot in New Zealand.

WISCONSIN FAVORS DUCKLESS WEDNESDAY

Wisconsin hunters generally have regarded with favor the duckless Wednesday which the legislature prescribed when it passed a law prohibiting duck shooting on this one day of the week. The favor of the hunters has been indicated by the fact that not a single arrest report has been sent to the Conservation Commission of a person arrested for shooting on Wednesday. This duckless Wednesday is intended, not as a few people have indicated, to cut down the number of hunting days which Wisconsin hunters will have nor to help hunters in other states, but rather to improve hunting in Wisconsin and to better the condition of game birds in the state. Experience of eastern states have proved that hunting conditions are much improved by giving the ducks such rest periods and by providing game refuges where they are safe from shooting. In declaring that there shall be no duck hunting on Wednesdays, the Wisconsin legislature is following out the opinion of conservationists throughout the country. If ducks are allowed time to settle on feed beds and recuperate from the constant flying necessitated by continual shooting, they will linger longer in the North country before migrating. By having uninterrupted feeding, the meat of the birds is actually improved. There is no doubt that having such rest period as this Wednesday law provides, Wisconsin hunting will be benefited in the long run.—*American Game*, vol. CXII, no. 44, November 2, 1929, p. 436.

VIOLATOR FINED $2,000

Paul Jonkers, a resident of Lake Geneva, Wisconsin, paid the largest fine ever assessed in the state of South Dakota for killing pheasants. Apparently, Jonkers engaged in the business of canning the birds on an extensive scale. He was apprehended just as he was about to leave South Dakota in a high powered automobile. One hundred and fifty pheasants in half-gallon and gallon jars were packed in the machine.

Judge Fisher, of Redfield, South Dakota, assessed a fine of $2,000, establishing a new record.

REPORTS

STATEMENT OF EXPENDITURES

For the Period July 1, 1929, to September 30, 1929 of the Eighty-first Fiscal Year

Function	*Salaries and wages*	*Materials and supplies*	*Service and expense*	*Property and equipment*	*Total*
Administration:					
Executive and legal	$4,204 98		$24 70		$4,229 68
Clerical and office	4,426 13	$322 07	231 37	$102 85	5,082 42
Printing		237 10			237 10
Automobiles		77 34			77 34
Traveling			1,116 11		1,116 11
Postage			1,082 88		1,082 88
Telephone and telegraph			1,070 24		1,070 24
Freight, cartage and express			986 75		986 75
Rent			4,856 04		4,856 04
Heat, light and power			54 74		54 74
Accident and death claims			1,357 00		1,357 00
Legal			83 55		83 55
Total administration	$8,631 11	$636 51	$10,803 47	$102 85	$20,233 94
Education and research:					
Chief and assistant	$1,575 00				$1,575 00
Clerical and office	630 00	$22 13	$47 85	$276 37	976 35
Traveling			838 68		838 68
Photographer	300 00		24 50	241 68	566 18
Librarian	480 00	15 13	8 00	23 99	527 12
Exhibits			30 00		30 00
Research	1,300 00	48 04			1,348 04
State fair	276 00	260 71	800 35		1,337 06
Lecturers	1,095 00				1,095 00
Total education and research	$5,656 00	$346 01	$1,749 38	$542 04	$8,293 43
Publicity:					
Chief of bureau	$825 00		$119 64		$944 64
Traveling			33 15		33 15
Total publicity	$825 00		$152 79		$977 79
Patrol and law enforcement:					
Chief and assistants	$3,315 00				$3,315 00
Clerical and office	700 00	$48 48	$12 64		761 12
Automobiles		507 05	539 69		1,046 74
Traveling			33,827 34		33,827 34
Captains and deputies	52,086 45	68 08	39 62		52,194 15
Fish planting	1,179 27	337 77	908 00	$828 00	3,253 04
Watchman	15 00				15 00
Launches	510 00	222 33	40 88		773 21
Premiums on bonds			370 00		370 00
Total patrol and law enforcement	$57,805 72	$1,183 71	$35,738 17	$828 00	$95,555 60
Commercial fisheries:					
Chief and assistants	$2,625 00				$2,625 00
Clerical and office	2,234 39	$72 38	$24 65	$1 84	2,333 26
Automobiles		96 36	27 11		123 47
Traveling			4,317 37		4,317 37
Research	1,705 00				1,705 00
Captains and deputies	4,250 00	3 61			4,253 61
Launches	1,215 00	352 77	397 06		1,964 83
Statistics	735 00				735 00
Laboratory	8,034 01	207 35	109 22	72 13	8,722 71
Freight, cartage and express			3 69		3 69
Heat, light and power			2 11		2 11
Botulism			3,750 00		3,750 00
Postage			5 00		5 00
Inspectors	3,552 38				3,552 38
Total commercial fisheries	$24,380 78	$732 47	$8,936 21	$73 97	$34,123 43
Fish culture:					
Chief and assistants	$1,650 00				$1,650 00
Clerical and office	975 00	$13 30		$1 05	989 35
Automobiles		1,511 87	$497 09	580 25	2,589 21
Traveling			3,673 73		3,673 73
Freight, cartage and express			15 42		15 42
Telephone and telegraph			184 22		184 22
Rent			134 13		134 13
Heat, light and power			215 30		215 30
Hatcheries	36,616 94	26,261 94	911 41	1,197 83	64,988 12
Special field investigations	2,885 00	18 97	318 08		3,122 05
Fish cars		57 47	781 93		839 40
Total fish culture	$42,126 94	$27,863 55	$8,031 31	$1,779 13	$78,400 93

STATEMENT OF EXPENDITURES—Continued

Function	Salaries and wages	Materials and supplies	Service and expense	Property and equipment	Total
Hydraulics:					
Chief and assistants	$1,485 00		$18 37		$1,503 37
Clerical and office			8 57		8 57
Automobiles		$83 17	1 25		84 42
Traveling			474 23		474 23
Cooperative research	750 00	2 10	11 45		763 55
Blue printing			7 99		7 99
Total hydraulics	$2,235 00	$85 27	$521 86		$2,842 13
Game propagation:					
Superintendents	$825 00				$825 00
Automobiles		$90 23			90 23
Traveling			$798 65		798 65
Heat, light and power			93 20		93 20
Laborers	2,019 08				2,019 08
Maintenance		1,585 67	144 87	$24 89	1,755 43
Total game propagation	$2,844 08	$1,675 90	$1,036 72	$24 89	$5,581 57
Fish rescue:					
Chief and assistants	$1,240 00		$7 60	$4 10	$1,251 70
Traveling			558 62		558 62
Rent			20 00		20 00
Total fish rescue	$1,240 00		$586 22	$4 10	$1,830 32
Game refuge:					
Chief and assistants	$999 99				$999 99
Clerical and office	450 00				450 00
Automobiles		$114 90	$122 32		237 22
Traveling			510 38		510 38
Lion hunters and trappers	1,678 00				1,678 00
Refuge posting	666 00	73 33			739 33
Game refuge supplies		6 15			6 15
Lion bounties			1,010 00		1,010 00
Total game refuge	$3,793 99	$194 38	$1,642 70		$5,631 07
License commissions			$9,057 10		$9,057 10
Construction of Russian River jetties					17,750 00
Expenditures to pay claims for return of fish and game licenses					83 50
Prior year					122,768 06
Grand total					$403,129 77

STATEMENT OF INCOME

For the Period July 1, 1929, to September 30, 1929, of the Eighty-first Fiscal Year

	Detail	Total
License sales:		
Fish breeders' licenses, 1929	$55 00	
Angling, 1929	158,935 70	
Hunting, 1929	68,636 22	
Wholesale fish packers' and shell fish dealers', 1928–29	20 00	
Game breeders' licenses, 1929	65 00	
Fish importers' licenses, 1929	50 00	
Trapping licenses, 1929–30	151 00	
Commercial hunting club, 1929–30	1,440 00	
Commercial hunting club operators', 1929–30	325 00	
Deer tag licenses, 1929	16,740 00	
Kelp licenses, 1929	10 00	
Market fishermen's licenses, 1929–30	16,280 00	
Wholesale fish packers' and shell fish dealers', 1929–30	875 00	
Total license sales		$263,582 92
Other income:		
Game tag sales	$5 76	
Court fines	19,253 28	
Fish packers' tax	9,675 20	
Kelp tax	22 60	
Fish tax sales	1,074 45	
Miscellaneous sales	327 20	
Interest on bank balances	1,446 35	
Total other income		31,804 84
Total departmental income		$295,387 76

SEIZURES OF FISH AND GAME

July, August, September, 1929

Abalone, pounds	228
Barracuda, pounds	4,297
Bass, black	252
Bass, striped	110
Catfish	12
Clams	3,069
Crabs	93
Grunion, pounds	15
Halibut, pounds	531
Lobsters	83
Sardines, pounds	4,600
Salmon	21
Sunfish	90
Trout	142
Trout, pounds	427
Nets, drag	1
Bear	1
Deer	50
Deer meat, pounds	260
Deer hides	7
Doves	1,481
Ducks	117
Grouse	2
Geese	2
Non-game birds	6
Pheasants	1
Quail	23
Quail, canned—cans	30
Rabbits	30
Sage hens	2
Shore birds	1
Tree squirrels	2

GAME CASES

July, August, September 1929

	Number arrests	Fines imposed	Jail sentences (days)
Violations of Hunting License Act	69	$1,445 00	5
Bear: closed district	1		
Deer meat, closed season; killing does, spikes, fawns; failure to tag	120	7,010 00	366
Deer: dogs running	1	25 00	
Deer hides: illegal	3	150 00	
Doves: overlimit; closed season	64	1,950 00	30
Ducks: closed season; selling of	10	465 00	240
Geese: closed season	1	25 00	
Non-game birds: Killing of	14	285 00	
Pheasants: possession of	3	500 00	150
Pigeons: closed season	1	25 00	
Quail: closed season	18	600 00	15
Rabbits: closed season	14	285 00	
Shore birds: killing of	1		5
Tree squirrels: possession of	3	60 00	
Night hunting	3	300 00	
Hunting in game refuge	9	290 00	6
Trapping: License Act	1	25 00	
Shooting from auto	5	40 00	180
Trespass Act	5	200 00	
Game farming: no license	1		
Totals	345	$13,655 00	997

FISH CASES

July, August, September, 1929

	Number arrests	Fines imposed	Jail sentences (days)
Violations of Angling License Act	63	$1,605 00	1
Abalone: small	64	1,680 00	
Barracuda: small	2	60 00	
Striped Bass: small	12	370 00	
Black bass: small	43	880 00	
Catfish: selling in closed season	1	50 00	
Clams: small; over limit; oversize	71	2,505 00	2
Crabs: closed season	3	115 00	
Eels: small	2	40 00	
Grunion: closed season	1	25 00	
Halibut: small	3	20 00	
Lobsters: closed season	2	65 00	
Salmon: closed season	4	810 00	
Sunfish: closed district	1	10 00	
Trout: over limit	15	575 00	
Nets: illegal	4	100 00	
Illegal fishing apparatus	14	175 00	
Pollution	4	100 00	
Fishing too near dam or fishway	11	370 00	
Commercial Fishing License Act: violations of	75	1,407 00	
Totals	395	$10,962 00	3

HUNTERS KILLING TWO DEER

County of residence	Number of hunters	County of residence	Number of hunters
Alameda	115	Riverside	3
Alpine		Sacramento	5
Amador	3	San Benito	2
Butte	42	San Bernardino	2
Calaveras	13	San Diego	1
Colusa	35	San Francisco	10
Contra Costa	26	San Joaquin	1
Del Norte	4	San Luis Obispo	4
El Dorado	30	San Mateo	2
Fresno	77	Santa Barbara	9
Glenn	45	Santa Clara	7
Humboldt	63	Santa Cruz	8
Imperial	4	Shasta	3
Inyo	24	Sierra	
Kern	64	Siskiyou	8
Kings	13	Solano	3
Lake	23	Sonoma	9
Lassen	8	Stanislaus	8
Los Angeles	266	Sutter	2
Madera	14	Tehama	2
Marin	24	Trinity	2
Mariposa	9	Tulare	5
Mendocino	87	Tuolumne	1
Merced	15	Ventura	2
Modoc	1	Yolo	2
Mono	3	Yuba	1
Monterey	61	Nevada, State of	1
Napa	29	Oregon, State of	5
Nevada	11	Texas, State of	1
Orange	48	Washington, State of	2
Placer	25		
Plumas	25	Total	2,3

DEER KILLED IN 1927-1929, BY COUNTIES

County	Deer killed 1927	Deer killed 1928	Deer killed 1929	Land area, square miles
Siskiyou	1,665	1,654	1,211	6,256
Mendocino	1,475	1,468	1,355	3,539
Lake	901	1,038	841	1,238
Tulare	744	939	807	4,866
Santa Barbara	669	851	717	2,740
Tehama	799	846	758	2,925
Monterey	757	830	734	3,330
Trinity	921	800	751	3,096
Humboldt	821	777	689	3,575
Fresno	592	763	764	5,950
Sonoma	751	753	732	1,582
Modoc	510	729	835	3,823
Shasta	612	603	702	3,858
Glenn	623	592	586	1,337
Plumas	551	586	695	2,593
Napa	442	560	523	783
El Dorado	535	548	597	1,737
Santa Clara	397	536	577	1,328
San Luis Obispo	394	450	455	3,334
Marin	367	444	394	529
Lassen	296	393	511	4,531
Los Angeles	425	369	691	4,115
Ventura	274	362	346	1,878
Placer	341	346	335	1,411
San Benito	217	320	269	1,392
Madera	260	300	313	2,112
Kern	218	295	297	8,003
Colusa	263	272	297	1,140
Alameda	220	263	275	732
Riverside	323	249	404	7,223
Inyo	173	239	253	9,991
San Diego	169	232	233	4,221
Tuolumne	213	213	212	2,190
Butte	228	212	234	1,608
Calaveras	149	191	175	1,027
Yolo	115	169	176	1,014
Nevada	125	140	169	974
Mariposa	95	134	141	1,460
San Bernardino	74	122	120	20,175
Stanislaus	91	115	119	1,450
Sierra	101	102	132	923
Santa Cruz	78	92	102	435
San Mateo	77	89	102	447
Amador	59	78	87	601
Orange	56	69	81	795
Merced	67	68	48	1,095
Alpine	67	66	89	776
Mono	36	55	76	3,030
Solano	45	52	54	822
Yuba	53	52	55	632
Del Norte	42	48	55	1,024
San Joaquin	21	14	22	1,448
Contra Costa	5	6	14	714
Imperial	1	4	4	4,089
Kings	3	3	3	11,159
Sutter	1	3	2	608
Sacramento	----------	2	----------	983
San Francisco	----------	----------	----------	42
Totals	10,507	21,515	21,222	155,672

County where deer was killed	County of residence of hunter																				
	Alameda	Alpine	Amador	Butte	Calaveras	Colusa	Contra Costa	Del Norte	El Dorado	Fresno	Glenn	Humboldt	Imperial	Inyo	Kern	Kings	Lake	Lassen	Los Angeles	Madera
Alameda	196						20												1	
Alpine	11	2	4	11				1												
Amador	5		42				3		1						1				2	
Butte	3			188		2	1		1										3	
Calaveras	7		4		81		1												8	1
Colusa	17			5	1	150	13		1	1	11						1		5	
Contra Costa	1						12													
Del Norte	3							35				1				1			3	
Eldorado	22		29	3	1	2	4		262						1				9	
Fresno	9						3			416				8	37	24			109	6
Glenn	25			30		70	6				201		1						16	
Humboldt	24					1	4	7		5		486	1		1	3			19	
Imperial													2							
Inyo	3									2				127	11				78	1
Kern													2		182	1			73	
Kings										2										
Lake	83			4	1	36	35			2	7				9		249	1	22	
Lassen	23			26		18	5			6	3			1	3	2	6	154	20	
Los Angeles																			656	
Madera	2						1				98			2	3	5			34	99
Marin	18						4			1									1	
Mariposa	7									6									7	13
Mendocino	114			6		13	30	1		10	17	12	1		3	3	3		50	2
Merced	1									3										
Modoc	32			20	1	17	26	2		12	21	0	2		2	8	40	11	46	2
Mono														18	1				23	
Monterey	18						4			12			1	3		1			19	1
Napa	42			1			14								1		4		5	
Nevada	6						1								1	1			6	
Orange															1				16	
Placer	18			1			2		8										15	
Plumas	24			73		10	6		3	2	5	1			2		1	68	42	
Riverside												1	4						101	
Sacramento																				
San Benito	6						5			15					1				9	2

County where deer was killed	County of residence of hunter																				
	Madera	Marin	Mariposa	Mendocino	Merced	Modoc	Mono	Monterey	Napa	Nevada	Orange	Placer	Plumas	Riverside	Sacramento	San Benito	San Diego	San Francisco	San Joaquin	San Luis Obispo	San Mateo
Alameda																					
Alpine																					
Amador																					
Butte																					
Calaveras																					
Colusa	1																				
Contra Costa																					
Del Norte																					
Eldorado																					
Fresno																					
Glenn																					
Humboldt																					
Imperial																					
Inyo																					
Kern																					
Kings																					
Lake																					
Lassen																					
Los Angeles																					
Madera																					
Marin																					
Mariposa																					
Mendocino																					
Merced																					
Modoc																					
Mono																					
Monterey																					
Napa																					
Nevada																					
Orange																					
Placer																					
Plumas																					
Riverside																					
Sacramento																					
San Benito																					

San Bernardino													2						25		
San Diego													11						8		
San Francisco																			1		
San Joaquin	3						1			4					22				20		
San Luis Obispo	2																				
San Mateo													1		85	2			76		
Santa Barbara	1						4			1									4		
Santa Clara	52																				
Santa Cruz	6									2	7	2			1		5	11	39	3	
Shasta	42			17	1	11	13								1			1	2		
Sierra	8			1			3								8	9	5	1	71	2	
Siskiyou	74			14		9	18	1	1	9	8	3	3		1					1	
Solano	4														1		2		15		
Sonoma	41						16												2		
Stanislaus	3				1		2														
Sutter															5	2	13	2	75		
Tehama	47			46		18	6	1		12	30				6	5	4		34		
Trinity	61			9		5	10	2		5	19	97			96	25			273		
Tulare	2									13				13					8	1	
Tuolumne	5		2		15		6			1					31				134		
Ventura	1									1			1				1		3		
Yolo	14					1	7												2		
Yuba	4			3			1			1											
Totals	1,090	2	81	447	113	303	289	49	278	544	441	609	32	172	519	92	334	249	2,199	134	

STATISTICS ON DEER KILL, SEASON 1929—Continued

County where deer was killed	County of residence of hunter																			
	Marin	Mariposa	Mendocino	Merced	Modoc	Mono	Monterey	Napa	Nevada	Orange	Placer	Plumas	Riverside	Sacramento	San Benito	San Bernardino	San Diego	San Francisco	San Joaquin	San Luis Obispo
Alameda				2							1			2				17		
Alpine														9				2	31	
Amador														14				1	13	
Butte								2		2	1	1		4			2	6	2	
Calaveras				5										2				5	43	
Colusa							1	3	2					14		1		7	10	
Contra Costa								1												
Del Norte																	1	5		
Eldorado	1			2			5	1	1	1	40			138		1	1	11	23	
Fresno				12			6			4	1				5	1	5	7	3	2
Glenn	3			2			1	2	1		3			26				27	20	
Humboldt	2		21					3		3			3				4	40	1	
Imperial													2							
Inyo						2				7			4			8	3	2		
Kern								1		4			5			14	4	1		2
Kings																				
Lake	6		19	3			3	42		4	2		2	33	1	1	3	67	19	
Lassen	1	1	10		7		6	7		4	14	9		17	2	3	4	14	6	
Los Angeles										8			1			8	2	2		
Madera	1	6	1	23		2				1				2		10		3		
Marin	30							1										69	2	
Mariposa		57		17										2	1			4	2	
Mendocino	33		504	6			3	7		11	2		5	17	1		1	219	22	2
Merced				26											5	2		1		
Modoc	5		24	10	142	1	9	8	1	3	4	2	2	35	12	2	12	26	20	9
Mono			1	1		20				2			1			2	1			
Monterey	1			4			455			11	2			2	7	2	1	26	1	64
Napa	5						1	278		1	1			11				31	7	
Nevada	1							2	96		19			12				5		
Orange										64										
Placer	4							1	17		134			14				15	11	
Plumas	4			1			4	4		8	13	230	1	16	1		3	16	9	
Riverside										33			107			51	15			2
Sacramento														2	142			5		1
San Benito				6			24	9		2										

San Bernardino										12			6			75					
San Diego										13			11			6	184				
San Francisco															1					12	
San Joaquin				1			8			7			1			5		3			332
San Luis Obispo							3											14			
San Mateo							1			15			2			1	2				23
Santa Barbara	1						7			2					1	26		1	38	3	1
Santa Clara	5			3															3		
Santa Cruz							1	9		4	5	1	1	16	6	4	1	22	8	1	
Shasta	2		1	4	4			2	11		4	6		7				13	1		
Sierra	2							9													
Siskiyou	4		3	9	2		5	9	1	12	3	3	5	20	1	2	4	40	11		
Solano								2						2				4			
Sonoma	20		5	2				8						5				98	1	1	
Stanislaus				20			1						2	2	4			3	7		
Sutter																					
Tehama	3		3	3			5	10		16	12	1	2	24		1	2	26	15		
Trinity	14		61		3		1			15	1		1	16	4		7	48	9		7
Tulare							8			35			4			7	6				7
Tuolumne	1		1	1										1				8	17		2
Ventura										6						1	1				3
Yolo	3													15		2		4			
Yuba							1		1					4			3				
Totals	352	64	654	163	159	25	559	412	134	310	262	253	258	515	219	213	273	958	329	459	

STATISTICS ON DEER KILL, SEASON 1929—Continued

County where deer was killed	County of residence of hunter																			
	San Mateo	Santa Barbara	Santa Clara	Santa Cruz	Shasta	Sierra	Siskiyou	Solano	Sonoma	Stanislaus	Sutter	Tehama	Trinity	Tulare	Tuolumne	Ventura	Yolo	Yuba	Non-residents	Totals
Alameda	18		18																	275
Alpine										17									1	89
Amador			2					2									1			87
Butte								1		1	2	1					5	6		234
Calaveras			1					1	1	7	3				5					175
Colusa			4	1					3	1	18	1					22	4		297
Contra Costa																				14
Del Norte									2	1									3	55
Eldorado	7	3	5	1				7	2	4	2					1	5	2		597
Fresno		2	2	1						9				88		4				764
Glenn	2		9		1			21	8	8	24	21		1		1	38	15		586
Humboldt	4	2	12	2			2	1	14	10		2	7	2			3			689
Imperial																				4
Inyo														1		3		1		253
Kern		1												5		2				297
Kings		1																		3
Lake	12	3	12	5				40	58	7	17			3		2	22	6		841
Lassen	3	2	18	5	6	3		10	18	12	11	17		5		2	13	1	4	511
Los Angeles																12				601
Madera	4		7	1						2				6						313
Marin	7		4					2	55											394
Mariposa	2	1	4	3					2	15				1						144
Mendocino	29	1	14	5			1	18	157	9	1	6	2			2	8		4	1,355
Merced			1	6						3										48
Modoc	8	3	23	12	18	1	12	19	60	30	10	6		13		5	11	7	22	835
Mono			1	1											3				1	76
Monterey	10	7	28	44				3								7				734
Napa	5	1	6					70	12							1	26			523
Nevada			1				1	1			1						2	13		169
Orange																				81
Placer	4		8	2				10	15	4	6			2	2			10	6	335
Plumas	6		12	6		17		6	12	6	40	7					13	15	4	695
Riverside																				404
Sacramento																				
San Benito	6	1	15	7				1	3	1				3		1	1	1		269

San Bernardino																				120
San Diego																				233
San Francisco																				
San Joaquin	2			1						1										22
San Luis Obispo	1	39	3	1										1		5				455
San Mateo	65		15	5																102
Santa Barbara		467														39			1	717
Santa Clara	19	1	383	20				1		4				1						577
Santa Cruz	5		8	78						2										102
Shasta	11	1	9	9	340		19	12	14	10	4	15		3		1	4	5	1	702
Sierra						55		1			2						1	2	4	132
Siskiyou	11	3	20	9	35		653	13	13	6	12	9		4		3	20	1	29	1,211
Solano	1							32	1								6			54
Sonoma	5		2					11	493	3							1	1	1	732
Stanislaus		1		5						60						3	3			110
Sutter								1			1									2
Tehama	4	2	27	11	15		4	20	17	26	23	175	3	3	1		21	6		758
Trinity	3	2	0	11	53		5	6	42	12	10	12	137	1		5	1	7		751
Tulare		15	2							1				292		4			4	807
Tuolumne	1		6							22					113					212
Ventura		3														161				346
Yolo								12	1	1	1			2			109			176
Yuba				1		1		1		1	6							25		55
Totals	255	562	691	253	408	77	697	323	1,003	297	194	272	149	437	127	264	333	128	85	22,222

DEER KILLED IN DISTRICTS 2-2½-3 AUGUST 1-SEPTEMBER 14, 1929

	Aug. 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Alameda	35	13	16	20	3	3	5	9	5	2	12	4	1	5	3	1	4	10	1	1	3	2	3
Colusa	51	34	14	21	4	6	4	4	7	2	10		3	2	8	2	2	5	5	3	5	3	4
Contra Costa	1			1					1								3			1	1		
Fresno	24	7	10	13	2	1	1		1	1	2	2			2		1	2					
Glenn	131	78	45	38	21	13	9	10	8	4	13	5	5	5	6	7	9	14	7	4	6	5	6
Kern	8	2	4	4		1	4			4	4	2		1	2	1		6			1		
Kings	1			1							1												
Lake	141	70	65	53	15	17	20	12	9	14	30	5	7	5	9	5	14	27	5	6	5	8	10
Marin	43	10	6	29	4	5	7	1	7	11	22	2		3	9	5	6	20		2	1	9	6
Mendocino	192	82	83	66	38	41	26	23	16	20	42	19	14	22	10	24	12	36	15	18	24	14	14
Merced	7		1	4	1		1	1	2	2	5			1		1	1	1	1			1	3
Monterey	115	38	46	46	24	14	11	7	10	14	27	10	5	11	7	9	7	17	1	7	7	4	11
Napa	72	18	24	40	7	2	4	12	4	7	29	4	2	4	4	5	8	20	2	6	2	7	6
San Benito	53	24	7	9	3	8	3	2	1	9	15	4	3	1	1	2	5	5		1		4	3
San Francisco															1	1	1			1		1	
San Joaquin	3		1			1		1		2													
San Luis Obispo	52	20	21	31	10	9	8	14	9	8	17	13	2	5	6	2	4	11	4	2	6	3	6
San Mateo	9	2	7	9			2	3	1	1	4			1	3	1		8				3	1
Santa Barbara	144	57	32	36	21	14	15	10	13	6	20	7	4	6	11	7	7	17	4	5	8	7	10
Santa Clara	81	34	24	38	6	4	12	8	9	7	23	1	8	4	7	5	12	16	2	3	8	6	5
Santa Cruz	17	3	5	8	1	3	3		1	1	7		1	1	2	1		8		3		1	1
Solano	6	3	3	3		2	1		2	3	2	1		2			1	1			1	2	1
Sonoma	70	30	17	47	10	12	13	6	17	13	31	3	8	7	2	6	12	32	6	5	7	9	7
Stanislaus	25	12	3	6	1	1	1	2	1	1	9				1	1	1	8		1	3		2
Ventura	88	23	17	21	4	6	2	6	8	11	15	1	4	3	10	5	7	13	1	1	2	5	3
Yolo	40	4	10	10		1	8	2	2	4	5	2	1		2	1	3	1	1	5		1	2
Totals	1,409	564	461	563	175	164	160	133	134	147	345	85	68	92	111	92	120	278	55	75	90	95	104

DEER KILLED IN DISTRICTS 2-2½-3 AUGUST 1-SEPTEMBER 14, 1929—Continued

	24	25	26	27	28	29	30	31	Sept. 1	2	3	4	5	6	7	8	9	10	11	12	13	14	Totals
Alameda	3	11		1	1	2	3	2	7	15	2		2	3	2	10	6	4	5	4	7	9	275
Colusa	7	11	2	4	4	3	5	3	9	5	3	4		4	2	8	4	4	3	4	1	8	297
Contra Costa		1							2	1		1	1	1		2				1		3	14
Fresno		2	1	1	1		1		16	19	3	2			6	18	4		1		5	9	83
Glenn	2	14	4	3	6	8	4	9		2			1	4	1	1		1		1		2	586
Kern		4	1					1															63
Kings																							3
Lake	7	22	5	11	8	3	3	12	33	23	9	3	7	8	8	28	10	10	14	7	16	30	841
Marin	6	16		9	5	2	8	7	20	19	4	9	6	2	5	19	15	3	3	7	3	18	304
Mendocino	20	36	13	11	13	12	11	22	65	34	11	8	16	15	12	13	26	10	17	30	24	40	1,355
Merced	4							1		1					1	1			2				45
Monterey	8	26	4	10	4	9	4	9	23	20	3	9	5	15	7	27	15	8	13	16	14	37	734
Napa	5	35	3	3	5	8	5	6	22	25	5	5	2	3	12	18	13	3	7	13	8	26	523
San Benito		11	4	1	4	1	4		9	3	2	3	1	2	6	15	7	3	4	5	6	10	269
San Francisco																							22
San Joaquin		3					1		1				1						2	1			455
San Luis Obispo	4	16	5	7	6	9	6	9	12	10	2	5	2	9	7	10	7	8	5	10	20	23	102
San Mateo		8			3	4		1	10	3	1			2	1	5	3	1		2	1	2	717
Santa Barbara	4	15	3	10	3	3	4	11	24	17	9	11	6	5	20	32	8	11	16	9	13	22	577
Santa Clara	4	17	2	5	8	5	8	11	26	13	8	1	9	3	6	33	15	7	13	11	15	34	102
Santa Cruz		8	3				2		7	1	2				2	3	1	2		2		2	54
Solano		2						2	1	1			2	1		4	1		1	2	1	2	732
Sonoma	10	36	7	10	8	6	2	13	40	18	10	15	6	12	5	39	19	5	15	16	17	53	112
Stanislaus		2		2	3	1		4	5	3	1				1	9					1	1	346
Ventura	1	4			1	1	1	3	8	8	2	2	3	2	7	16	4	5	4	3	6	7	176
Yolo	3	4	3	1	1	3	2	4	8	8	1	2	1	1	3	8	1	3	3	5	1	5	
Totals	95	304	60	89	84	80	74	130	348	250	79	80	71	92	114	355	165	94	132	150	159	349	8,877

DEER KILLED IN DISTRICTS 1-1½-1¾-4-4½-4¾ SEPTEMBER 1-OCTOBER 16, 1929

	Sept. 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Alpine																20	13	8	8	5	4	4	3
Amador																16	7	3	1	2	2	3	1
Butte																21	12	4	9	9	12	22	4
Calaveras																40	14	11	5	4	5	10	5
Del Norte	14	8		3	3		1	2	2						2						1	1	
El Dorado																70	31	20	21	15	21	42	10
Fresno																126	71	29	43	38	26	30	25
Humboldt	136	46	14	14	19	11	12	16	15	16	8	4	4	8	13	9	3	5	6	5	11	13	15
Imperial																			1				
Inyo																66	19	13	10	6	8	12	3
Kern																37	16	18	13	7	9	17	2
Kings																							
Lassen																78	36	37	19	33	33	28	17
Los Angeles																78	16	15	18	15	24	58	11
Madera																75	34	26	17	15	10	15	5
Mariposa																21	6	7	4	12	3	4	2
Merced																							
Modoc																119	64	56	50	37	35	30	25
Mono																10	10	3	3	6	3	5	2
Nevada																18	14	3	5	8	5	5	2
Orange																10	6	3	3		8	3	3
Placer																66	29	17	13	8	7	23	9
Plumas																119	40	28	27	45	44	45	13
Riverside																79	17	8	20	9	9	26	3
Sacramento																							
San Bernardino																18	7	5	6	2	2	8	4
San Diego																33	9	9	8	8	13	16	10
San Joaquin																							
Shasta																89	41	19	31	39	24	36	18
Sierra																15	7	5	6	5	3	17	2
Siskiyou	154	55	35	26	19	24	19	26	9	19	9	4	10	10	8	76	55	35	25	19	25	46	15
Stanislaus																2				1	1	1	
Sutter																							
Tehama																89	46	34	29	28	35	29	17
Trinity																62	37	33	52	36	36	25	33
Tulare																150	111	70	52	52	39	28	23
Tuolumne																32	13	10	9	10	8	17	5
Yuba																4	1	1	1		3	4	2
Totals	304	109	49	43	41	35	32	44	26	35	17	8	14	18	23	1,657	785	535	515	479	469	621	289

DEER KILLED IN DISTRICTS 1-1½-1¾-4-4½-4¾ SEPTEMBER 1-OCTOBER 15, 1929—Continued

	24	25	26	27	28	29	30	Oct. 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Totals
Alpine	2	3	1	2	1	2	1	1		1			3			1	1		3	1	1		89
Amador		1	1			10	1			2		1	7		4	1	2	1	4	10	1	6	87
Butte	7	3	3	4	10	22	6	4	3	5	1	2	8	11	7	4	4	3	6	16	6	6	234
Calaveras	3	2	1		6	5	6	3	1	2	4	2	9	5	3	3	2	1	5	7	5	6	175
Del Norte						2			1					3	1		2	1	3	2	2	1	55
El Dorado	15	19	10	7	11	43	9	5	7	7	11	17	31	14	11	11	6	6	19	58	14	27	597
Fresno	14	10	13	0	13	14	6	7	11	7	9	6	18	11	7	19	10	14	21	43	14	17	681
Humboldt	8	6	7	9	12	27	7	5	3	7	8	13	18	11	12	20	20	11	9	36	22	13	689
Imperial					1															1		1	4
Inyo	8	4	5	1	4	10	5	1	1	3	1	5	6	3	8	5	3	2	4	8	11	17	253
Kern	4	3	5	2	0	9	3	3	3	5	3	2	10	4	3	2	4	5	6	16	5	12	234
Kings																							
Lassen	17	5	9	11	7	20	5	6	10	8	6	10	11	10	10	16	14	12	11	13	8	5	511
Los Angeles	7	12	13	13	23	54	11	3	12	13	13	30	35	2	5	22	22	17	29	57	23	40	691
Madera	4	2	6	0	2	5	4	2	3	4		6	4	3	5	8	8	8	7	12	8	6	313
Mariposa	4	2		4	3	6	1	2	1	2	1	2	7	2	2	2	5	2	9	13	5	9	144
Merced		1				1														1			3
Modoc	18	17	11	19	13	22	14	14	10	20	15	16	18	23	22	23	26	20	26	32	28	12	835
Mono	1		2	2		2	4	1	1			1	6	3	1	2	1	1	1	1	2	2	76
Nevada	2	2	4	4	7	18	2	3	2	5	2	1	9	3	2	2	1	0	4	13	7	10	160
Orange	3		1	4	3	1	1	2	3	2		1	3	2	2		4	2	6	2		3	81
Placer	3	5	8	6	10	19	5	2	4	9	3	7	16	2	3	5	8	6	8	16	8	10	335
Plumas	24	29	14	8	10	34	8	14	13	10	12	9	20	18	12	14	4	11	14	27	14	15	695
Riverside	2	6	8	5	11	21	6	3	6	6	6	13	22	11	5	5	12	10	17	26	20	9	404
Sacramento										1		3	5	1		2	3	2	4	15	6	6	120
San Bernardino	3	2	2	1	2	6	3	3															
San Diego	3	3	3	1	7	16	1	2	3	4	4	4	15	6	4	3	1	8	8	17	6	8	233
San Joaquin																							
Shasta	17	13	21	9	13	38	15	15	11	12	13	12	33	9	12	21	13	18	29	31	24	26	702
Sierra	4	1	3	2	3	7	2	2	2	3	3	3	2	3	2	7	1	1		13	5	3	132
Siskiyou	4	18	14	17	0	24	10	12	15	22	21	27	28	14	24	20	26	28	26	51	43	35	1,211
Stanislaus					1										1								7
Sutter						1													1				2
Tehama	16	17	15	15	13	23	13	13	10	16	15	12	29	16	18	33	25	20	41	41	30	20	758
Trinity	14	14	28	15	22	27	14	15	5	17	12	18	24	21	15	26	23	27	28	20	29	23	751
Tulare	12	15	17	7	9	10	8	6	16	6	8	15	16	12	12	17	16	13	19	21	15	12	807
Tuolumne	3	4	1	3	6	8	3	2	1	3	4	4	18	5	6	2	7	4	4	10	5	5	212
Yuba		2	1	4	1	4	3	2		2	1	3	3	1	1	2	2		2	2	1	2	55
Totals	222	221	227	193	239	511	177	153	160	204	176	246	434	229	229	299	276	260	374	632	368	367	12,345

CALIFORNIA FRESH FISHERY PRODUCTS FOR THE MONTHS OF JULY, AUGUST AND SEPTEMBER, 1929

Compiled by Division of Fish and Game, Bureau of Commercial Fisheries

	Del Norte, Humboldt	Mendocino, Sonoma, Lake	Marin	Solano, Yolo	Sacramento, San Joaquin	Alameda, Contra Costa	San Francisco, San Mateo	Santa Cruz	Monterey
Albacore									
Anchovies							154,160		6,055
Barracuda								28	
Bonito								513	
Carp				1,023	3,814	7,184			
Catfish		598		510	64,131	40,224			
Cultus Cod	71,285	40,876	96				169,380	29,943	9,966
Flounders							150,954	35,252	753
Grayfish						4	52,461	938	8,650
Hake							29,937	3,250	90
Halibut	252,787	16,594	221				14,608	677	9,810
Hardhead					70				
Kingfish							15,239	7,386	4,940
Mackerel							3,875	971	411,326
Mackerel—Horse									10,696
Mullet									
Perch	1,261		1,041			13	25,520	3,746	2,190
Pike				23	83	67			
Pompano									
Rock Bass									
Rockfish	48,750	11,463					154,907	112,416	246,552
Sablefish	115,529						144,704	74,884	192
Salmon	1,096,905	1,163,080		92,644	114,772	135,161	530,780	90,673	147,744
Sandabs							240,518	19,687	306
Sardines							11,421,005	901	78,420,248
Sculpin								234	
Sea Bass—Black									
Sea Bass—White		44	40,232				2,318	24,268	4,830
Shad				271	507	1,334	0		
Shad—Buck				30	6	73			
Shad—Roe					32				
Sheepshead									
Skates							58,556	2,125	10,244

Skipjack							17,745	47,569	45,351
Smelt	16,077		4,505				2,340,893	143,438	27,897
Sole	1,941	58				314			
Splittail						75,313	10,462		
Striped Bass			127	8,092	4,914				
Swordfish							2,318		
Tomcod									
Tuna—Bluefin									
Tuna—Yellowfin							63		
Turbot			456				10,754		77
Whitebait	11,213	5,843							
Whitefish									
Yellowtail						364	6,792	6,618	1,847
Miscellaneous	11,011	2,214		17					
Total fish	1,020,779	1,211,370	46,678	102,610	188,329	260,081	15,570,087	605,517	79,378,773
Crustaceans:									
Crabs	[1]12,384						[3]135,864		[4]24
Shrimps			532,689				1,092,646		
Spiny Lobsters									
Mollusks:									
Abalones		350							1,341,650
Clams—Cockle		55	2,068						
Clams—Mixed	1,242								618
Clams—Pismo						1,535	1,831		
Clams—Softshell			9,303				5,295	218	29,003
Cuttlefish	25	11					[5]69,740		
Oysters—Eastern			[2]27,919				1,038		607
Oysters—Native			31,447						1,207,896
Squid									
Totals	1,643,430	1,241,786	650,104	102,610	188,329	261,616	16,885,501	605,765	81,958,661

All amounts shown in pounds unless otherwise specified. Skipjack and Albacore cleaned.
[1] 516 dozen.
[2] 126,004 shell oysters.
[3] 5,061 dozen.
[4] 317,000 shell oysters.
[5] 1 dozen.

CALIFORNIA FRESH FISHERY PRODUCTS FOR THE MONTHS OF JULY, AUGUST AND SEPTEMBER, 1929—Continued

Compiled by Division of Fish and Game, Bureau of Commercial Fisheries

	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego Imperial	Total	Fish from south of the International Boundary brought into San Pedro.	Fish from south of the International Boundary brought into San Diego.	Total fish from south of the International Boundary brought into California.
Albacore		139,004		89,195	228,199			
Anchovies		6,726	185		107,126			
Barracuda	2,806	706,491	73,536	411,600	1,194,464	123,421	116,483	239,904
Bonito		249,894	4,425	114,069	368,901	1,984,860	7,336	1,992,196
Carp					12,021			
Catfish					105,463			
Cultus Cod	108				321,654			
Flounders		1,700	16		194,675			
Grayfish	9,449	62,108	642	50,300	184,552			
Hake					33,277			
Halibut	70,968	65,776	2,410	6,286	446,146	31,626	118,039	149,665
Hardhead					70			
Kingfish		45,234	210	656	73,665		51	51
Mackerel	3,163	17,263,249	557,351	1,872,859	20,112,791			
Mackerel—Horse		286,125			290,821	1,687		1,687
Mullet				13,482	13,482			
Perch	1,354	17,703		118	52,972			
Pike					173			
Pompano		275		39	314			
Rock Bass	746	81,329	54,010	45,091	184,176	1,115	2,454	3,569
Rockfish	10,560	277,077	11,874	270,100	1,155,708		1,111	1,111
Sablefish					335,360			
Salmon					3,381,365			
Sandabs		4,832			265,343			
Sardines		33,568	300	7,188	89,892,270			
Sculpin	472	16,883	39	1,622	19,250			
Sea Bass—Black	1,128	19,496	2,226	18,031	40,876	7,942	35,481	43,426
Sea Bass—White	18,969	169,603	11,828	57,817	329,909	63,933	213,253	277,186
Shad					2,118			
Shad—Buck					109			
Shad—Roe					32			
Sheepshead	1,434	52,383	490	3,634	57,941			
Skates	155	5,049		737	76,866			

Skipjack		1,996,536		2,600,937	4,597,473	3,051,034	3,710,158	6,761,192
Smelt	5,385	76,891	23,558	1,451	238,532		704	704
Sole	30,285	44,226	45	204	2,595,077	910		910
Splittail					314			
Striped Bass					98,038			
Swordfish		102,545		303,427	405,972			
Tomcod					2,318			
Tuna—Bluefin		2,815,098	25	564,416	3,379,539	10,210	40,277	50,487
Tuna—Yellowfin		57,260		48,987	106,247	3,755,916	7,333,250	11,089,166
Turbot					510			
Whitebait					27,887			
Whitefish		7,794	42	7,685	15,521		150	150
Yellowtail		54,196	812	589,638	644,646	761,581	524,854	1,286,435
Miscellaneous	93	24,180	903	86	57,125		7,511	7,511
Total fish	172,079	24,686,234	747,927	7,079,745	131,718,209	9,794,235	12,111,115	21,905,350
Crustaceans:								
Crabs					[1]148,272			
Shrimps					1,625,335			
Spiny Lobsters								
Mollusks:								
Abalones	2,097				1,344,097	35,000		35,000
Clams—Cockle		6,698			8,821			
Clams—Mixed					1,242			
Clams—Pismo	30,978				31,596			
Clams—Softshell					12,669			
Cuttlefish	85		85		34,752			
Oysters—Eastern					[2]97,659			
Oysters—Native					33,182			
Squid					1,207,896			
Totals	205,239	24,692,932	748,012	7,079,745	136,263,730	9,829,295	12,111,115	21,940,410

[1] 6,178 dozen.
[2] 443,904 shell oysters.

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SACRAMENTO, 1930